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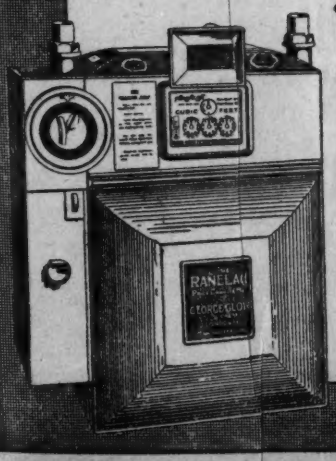

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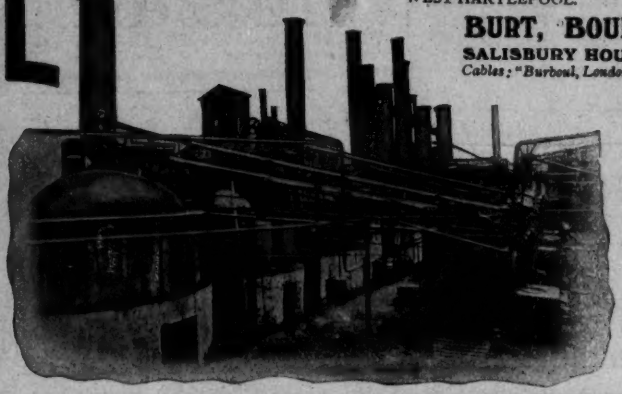

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EDITORIAL NOTES.

Coal Conservation and a Proper Perspective.

In the technical man's national programme, coal conservation has to-day prominent place. What is in mind when speaking of coal conservation is the economical use of coal, so that the life of our national reserves may be prolonged. Economical use means the elimination of waste for the service to be performed; and this is only to be accomplished by employing coal in the manner which will realize the highest possible efficiency. It will save much trouble later on if the carbonizing industries will see that their claims as contributors to coal conservation are not pitched too high, and if they will lay their claims, not so much on coal conservation as on the propriety of co-ordinating the use of fuel, or converting coal so as to supply its heat in a form that is handier and applicable with greater efficiency, at the same time saving labour, avoiding the pollution of the air by smoke, and placing at command a larger supply than at present of valuable secondary products if there is a demand for them, or, to the extent that there is not that demand, supplementing the ordinary processes of carbonization by the complete gasification of coal.

We are induced to call attention to the point as to the grounds on which claims in this regard should be made by the Presidential Address of Mr. R. E. Gibson to the Liverpool Engineering Society. In that address, he largely dealt with this matter of coal conservation, and presented the claims of the carbonizing industries in contributing to this desirable end. In approaching this question, one has to assume that the part of the heat expended from the coal used in this country which gives a return in useful work is the quantity of heat which is required in any event, and which must be provided whatever the agent or the efficiency in application. Mr. Gibson does not make himself responsible for the computation; but he says "it has been estimated that under existing conditions probably only 10 p.ct. of the potential energy of the coal is actually utilized in doing useful work—no less than 90 p.ct. of the heat energy being unproductive." In our opinion, the 10 p.ct. is a low estimate, and 20 p.ct. would be fairer as an average, seeing that it is a bad steam-boiler that does not give 50 or 60 p.ct. efficiency, and domestic fireplaces are credited by authorities with a 20 to 25 p.ct. efficiency, though the kitchen grate and numerous industrial operations cannot claim 20 p.ct. There are too the stand-by losses in both the domestic fireplace and industrial heating, which a controllable fuel such as gas largely wipes away. Admittedly there are difficulties in making a proper estimate; but we would rather in this matter give a little more than 10 p.ct. efficiency credit to coal. Then Mr. Gibson takes the coal output for 1922—viz., 24·6 million tons. Of this quantity, he finds that 25·7 p.ct. was exported; 62·3 p.ct. was burnt in the raw state; and only 12 p.ct. was scientifically treated for the production of smokeless solid and gaseous fuel and the recovery of bye-products. Then he proceeds to make this statement: "If only half this quantity were treated by processes of carbonization, there would be a far greater yield of heat units at the point of use than at present, and the country's coal resources would last at least twice as long as under the present wasteful methods; or, expressed in another way, if the present rate of output were to continue as it is to-day, there would be at least 125 million tons more coal available per annum either for export or for increased home requirements."

Is that true? We are not going to say it is not. But let us consider the matter by taking a ton of good coal, which has a potential heating value of 30,000,000 B.Th U. Assuming this is used at 20 p.ct. efficiency, the amount of productive heat would be 6,000,000 B.Th.U. Now gas is used for heating with varied efficiency—for example 50 or 60 p ct. on the hotplate (70 p.ct. in some modern examples) up to 75 p ct. in the gas-fire; but there are other uses where these efficiencies are not obtained. Let us therefore assume an average efficiency for heating of 50 p.ct. With a make of 13,500 c.ft. of 550 B.Th.U. gas from the ton of coal, we have 7,425,000 B.Th.U. Taking an average efficiency of 50 p.ct., we get 3,712,500 B.Th.U. doing productive work. Assuming 10 cwt. of coke for sale, of a calorific value of 12,500 per lb., this would represent a potential heating value of 14,000,000 B.Th.U. Used at 25 p.ct. efficiency, we should have 3,500,000 B.Th.U. usefully applied. Adding together the 3,712,500 B.Th.U. and the 3,500,000 B.Th.U., we have 7,212,500 B.Th.U. which have done useful work from the gas and coke produced by carbonization. To that figure could be added the work done by the fuel oils and the motor spirit produced from the tar. But we will pass that by. The 7,212,500 B.Th.U. compares with the 6,000,000 B.Th.U. for the coal used in the raw state, crediting it with an average efficiency of 20 p.ct.. The carbonization process shows a superior return in the matter of productive work in heating, but not such a return that we can claim there would be 125 million tons more coal available per annum either for export or for increased home requirements. Of course, another tale would be told if complete gasification was practised, and we had (say) a 70 p.ct. efficiency in the process, giving us (say) 21,000,000 B.Th.U. Used at an average efficiency of 50 p.ct., we should get 10,500,000 B.Th.U. applied to useful work, which would be a great move in coal conservation.

At any rate, carbonization can show a case for contributing to the conservation of coal, preserving the secondary products, and presenting collateral advantages of great national importance in respect of health and cleanliness, and obviating the erosion and the marring of the beauty of our finest buildings. In this, there would be a conservation of the wealth of the country far outstripping the conservation of coal. While we can point to all this, the case for electricity in respect of heating is of a different order. If we take the very best generation—representing an expenditure of 2·24 lbs. of coal per KW.-H, and 1000 KW.-H. per ton, and without making any deduction for losses in transmission (which may be from 20 to 30 p.ct.), we have only 3,420,000 B.Th.U. at the switchboard, and not at the consumers' terminals; and even that efficiency refers to the few and not the many electricity generating plants. That is the best that can be done. The efficiency in domestic heating service varies between about 40 p.ct. on the hotplate to something over 90 p.ct. for room heating, Supposing we take an average of 60 p.ct., we only get a little over 2,000,000 B.Th.U. doing productive work as the result of the complete destruction of a ton of coal.

It is clear that, while the gas process can claim the foremost position in advancing the conservation of coal, we must not put our case too high in respect of the saving in the nation's annual expenditure of coal that can be effected through carbonization while producing equal useful heating

service. We can claim something in that direction, but relatively the attendant advantages are of a much more valuable order. Concluding this comment, it should be said that the figures given in it are not put forward as meriting acceptance for positive accuracy. Some of them are well-known data; others are calculations. They are, therefore, purely illustrative of the point that we must not overrate (any more than we should understate) the coal economies derived from our system. There is little question that so far as the household is concerned the largest contribution towards coal conservation would be made by the elimination through the use of gas of the waste of coal that takes place through the upkeep of fires throughout the day when only required —intermittently—for perhaps two or three hours.

Balancing Carbonizing Conditions to Get Maximum Results.

A STUDY of the large variety of gas production returns obtained from gas-works operating under fairly comparable conditions and with similar classes of coal, indicates that there is not the thorough individual consideration given to the balancing of carbonizing conditions that there should be with the view of securing maximum results. Where this is not done, there is waste, and waste which means loss of money. One of the papers read at the auxiliary meeting of the North of England Gas Managers' Association directs attention to this matter through the relation of experiences of what has been done at the works of the Walker and Wallsend Union Gas Company, under the engineership of Mr. A. B. Walker. The paper was by Mr. G. E. Anderson, B.Sc. Though it was entitled "Random Notes on Works Topics," there was nothing really random about it; but it was directly illustrative of the good effects that can be derived from an ordered method of procedure in respect of carbonizing practices. The author asked "whether in many cases we are not too easily satisfied with our results so long as the routine in the retort-house and elsewhere goes on smoothly." He did not give an answer; but the form in which the question is framed leaves no doubt that the author could have emphatically replied to it, "We are." He did not do so; but in its place he submitted what is an obvious truth—that "the organization of past years is apt to become a habit." It is the habit of doing things in the old way that should be shaken off, unless research shows that existing practice cannot be improved upon. The trouble is that it is too often accepted without investigation that there is no room for improvement.

By investigation and experiment, improvement has been effected in the carbonizing results from the retort plant at the Company's Howdon works. The retort installation there comprises 22 in. by 16 in. by 20 ft. horizontals in settings of eights. Charges of 10½ cwt. and eight-hour carbonizing with these retorts was at one time the practice. Investigation led to the conclusion that the best was not being obtained. It also resulted in the adoption of a ten-hour carbonizing period, which supplies a sufficient margin for the necessary increase in the weight of coal per charge. The margin, representing a 25 p.ct. increase in time, as against a 20 p.ct. increase in coal, provided, at least on theoretical grounds, a decided tendency towards the elimination of badly burnt-off charges. Taking all factors into consideration, the best weight per charge was found to average 12·1 cwt., representing about 64 p.ct. of the carbonizing space, taking into account the extra thickness of scurf—viz., 2 to 2½ in. Those are the conditions that, with the size of retorts in use at the works and the character of the coal, have by study been determined to be correct. The results now obtained are the justification of the changed practice. Not only are partially burnt-off charges things of the past, but working heats and weight of coal per charge can be maintained with much greater regularity. The gas yield per charge has increased from an average of 6000 to 7350 c.ft., representing an increment of 22½ p.ct. for a 15¼ p.ct. actual increase in coal; and this, of course, means an increase of production per ton of coal. Carbonizing costs per therm have also been reduced. The thermal output per charge having increased from 33 therms on eight-hour working to 40·4 therms on ten-hour for the same labour costs, the reduction of these is fairly considerable. Furthermore, about 10,000 less charges have to be made per annum; thereby diminishing the wear and tear on the machines, and abbreviating the time taken by the draws. This statement of the case is not only highly instructive, but in one or two points it is novel in respect of proved advantages, which will compensate any slight disadvantage there may be—such as the very small reduction of therms per retort per day. But with improvements constantly going on, there is no intention at Walker to enthrone this as standard practice for all time. Even now experiments are being carried on with segmental silica retorts, for the purpose of showing conclusively whether or not the extra thermal conductivity at high temperatures warrants a return to the shorter carbonizing period without loss of efficiency. While the experiments are proceeding in respect of speedier heat transmission through the retort, perhaps they might be extended to ascertain whether a little admixture of coke with the coal would cause a more rapid heat transmission through the charge. If so, too, whether the still shorter period of carbonization would enable the throughput of coal per retort to be maintained or increased, and the make upheld or enhanced in any way; also whether or not the cost of labour would be increased—in other words, would the gains (if any) leave a balance in hand over and above the losses that might ensue?

Carbonizing heats are another factor that have to be taken into consideration in the work of co-ordinating conditions with the view of realizing the highest possible results. Carbonizing temperatures have been very largely in the gas industry determined by very crude methods; but slowly—in fact, very slowly—new and more accurate instrumental methods are being applied. Of course, one does not include here the large and more progressive medium size works; but inspection, and not actual test, is still all too considerably the mode of determination. However, at the Howdon works, Mr. Anderson tells us the working heats have been maintained fairly constantly at 1450° C.; but this high temperature has its drawbacks. It guarantees the complete evolution of the volatile content of the coal, but demands constant supervision, and tends to ascension-pipe troubles and low tar yields. The investigators are taking a very proper course in experimentally inquiring into the effects of reducing the heats by about 50° C. The research into this matter is not finished; but it is noticed that the gas yield remains much the same. It is about 66½ therms; but this is with coal having a volatile matter content of only 28·5 to 28·7 p.ct., which, partially at any rate, explains the low yield. A coal with volatile matter 1 p.ct. higher has lately been yielding 68·3 therms. Here Mr. Anderson presents a point which, he says, has been kept very much in the background. He submits that, in considering thermal yields per ton, it is important to remember that while, from a technical point of view, a yield of 70 therms is a desirable ideal, yet from the commercial point of view a yield of 60 therms provides a cheaper therm. The author refers to the factors that have to be considered in this relation. The factors in question are largely influenced (other than wear and tear) by market conditions; and he holds that where advantage can be taken of the market fluctuations in these without adversely affecting the gas consumer, the responsible official should endeavour to do so. Anyway, costs can be reduced by the disposal of labour to the best advantage. At Howdon a yield per man-shift of 660 therms is obtained at a cost of 0·189d. per therm. That is a low cost for labour, including as it does charging, discharging, pipe cleaning, coke quenching and depositing into overhead hoppers, but not cleaning fires and supervision.

The parts of the paper treating of the important questions of coke used per ton (which is to-day almost equally as vital as gas made per ton), of the recovery of coke from pan ashes, and of coke quenching are all worth reading. But the final part of the contribution, describing how washing for benzole is applied to the straight coal gas produced at Howdon, is of extreme interest in these days when so many gas engineers are asking, Does it pay? The plant is not worked with a view to securing the highest recovery efficiency, but its operation is governed by the calorific value of the gas. In other words, benzole washing is practised with a view to equalizing the quality of the gas; and this is done very successfully at all times of the year. The data supplied show that in the four quarters ending June last the greatest deviation from the declared value was *plus* 11 p.ct., 81 p.ct. of the tests came within 1 p.ct. of the declared value, while 56 p.ct. fell within ½ p.ct., as does also the quarterly averages. This at any rate indicates that the benzole method of regulating the calorific power is efficacious, and does not give away much beyond the declared value for which payment is not received. The financial aspect is in-

teresting. Mr. Anderson gives a tabulated statement, on the basis of 10,000 therms, in which he shows that without benzole washing the net cost per therm is 1·61d.; with benzole washing, 1·41d. per therm—cheaper by 0·2d. per therm. Those who think that 1·6 therms per gallon of benzole are of more financial advantage in the shape of gas than as benzole will examine Mr. Anderson's figures very critically to ascertain whether or not they can discover any "snag" in them, or where the differences arise which (shall we say?) justify opposing conclusions. The paper is full of excellent points; and it should have a good effect upon those who pay small heed to the factors which have an economic relationship in and to our carbonizing practices.

A Promising Smoke Abatement Conference.

THE Smoke Abatement Conference and Exhibition in Manchester last week give good assurance that the Smoke Abatement League of Great Britain intend that the attack upon the pollution of the atmosphere by the combustion of raw coal shall be of a very determined character. If we except Sheffield, perhaps there is no city in the country more suitable than Manchester in which to hold a conference and exhibition of the kind; for there ocular and other demonstration of the need for atmospheric reform by making a dead-set at the sources of the pollution is almost constantly of a nature that must act as a stimulant to the most lethargic in this particular matter. On the morning of the opening of the Conference and on other days, excellent examples of fogs, which held the miasma from countless industrial and domestic chimneys, enveloped the city, and challenged those who are the sworn enemies of such conditions. The work of the League has very cordial supporters in the Lord Mayor (Alderman W. T. Jackson), the then Lord Mayor-Elect (Alderman Fred. J. West), and in fact in all the civic representatives. The Lord Mayor and his successor were there to welcome, and to afford all facilities to, those with such a beneficent mission in hand. Alderman West predicted that the exhibition and conference were going to be the beginning of very real efforts to solve the smoke problem.

We express the heartiest of good wishes to the new Lord Mayor for a year of office crowned by an abundant success, not only in this direction, but in every matter which the responsibilities of his high office will impose upon him. His prediction regarding the solving of the smoke problem has more solid foundation now than ever before; for perseverance and invention, and the progress of the gas industry in realizing more fully that its commercial work is public service, have advanced the means in notable fashion for obtaining heat for most purposes without causing pollution. What is now wanted is the better education of the people, with perhaps legislation which will control to some extent, and in the right direction, the heating arrangements in all new dwelling-houses and other premises. The need for the education of the public was strongly expressed during the proceedings; and all who advocate this know that they have a hard task before them in attacking an indurated habit. But the cause of the need is a compelling one; and the difficulties of the task will only be a spur to greater effort.

The gas industry will be an effective coadjutor in this work, because it knows that it has in its possession the means—through gas and coke—for accomplishing the most salutary work. This was pointed out in a very plain way by Mr. F. W. Goodenough in his paper on "The Fuel of the Future." When we consider the large proportion of the thousands of million cubic feet of gas that in this country is used to-day for heating purposes, and the several million tons of coke which are also consumed annually for heating, we think that the "fuels of the future" have a very substantial claim to be considered fuels of the present. But, of course, we know what Mr. Goodenough has his eyes upon, and which prompts him to think of the future. With all the gas industry has done in developing the use of non-smoke producing fuels, there are still many millions of tons of coal consumed annually in industrial and domestic service, the greater part of the potential energy of which is wasted, with the destruction of the valuable chemical and other ingredients which have place in its complex structure. Of this waste and annihilation, the air-polluting emissions are accompaniments. Those millions of tons of crudely used coals are what Mr. Goodenough and all in the gas industry are out to displace and reduce gradually, by bringing them under the treatment which, at once, imparts those things that are valuable and cures those that are detrimental. It is a solid piece of work which confronts us, with a share in the educational propaganda which will bring the public into line as adherents of a great cause. Those who want facts for a case in regard to the position of gas in this matter will find them in Mr. Goodenough's paper; and that staunch champion of coke—Mr. E. W. L. Nicol, the Engineer and Fuel Expert of the London Coke Sales Committee—in his paper supplies material which gas men will find valuable in furthering the campaign on behalf of their first secondary product. Low-temperature carbonization had a good innings during the proceedings—notably in a paper by Mr. Harald Nielsen. Early opportunity will be taken to refer more specifically to certain points in these last-mentioned contributions.

Depriving a Gas Main of its Flexibility.

LOCAL authorities who are responsible for road work are also responsible for seeing that the work is so carried out as not to interfere with the structural security of mains and other works which are placed in the subsoil of roads by statutory authority. An interesting case has been decided in the Wandsworth County Court, in which the Wandsworth, Wimbledon, and Epsom District Gas Company claimed from the London County Council £19 1s. 11d. (the cost of diverting a fractured gas main) and £1 damage. The proceedings are reported in our "Legal Intelligence." The facts of the case are simple; and they were related to the Court by Mr. Cyril M. Croft, Chief Engineer of the Company, and other witnesses. The work which the plaintiffs submitted rendered the County Council liable was carried out in 1882 by the Metropolitan Board of Works, who were the predecessors of the Council. In that year, they constructed a manhole in the road where the accident occurred last year. In doing this, the gas main, instead of being diverted, was built into the manhole, and thus was rigidly held by it. At that point, therefore, it was impossible for the main to have any corresponding movement to that which its other parts might have which were free from similar restraint. In October, 1923, an escape of gas was reported; and investigation showed that the main had been fractured at the point where it was tightly held by the structure of the manhole. This is sufficient proof as to the cause of the fracture, more especially as examination of the main shows that it was physically in sound condition. It also positively proves bad engineering. For the defence it was stated that there are numerous other cases where gas mains are similarly embedded. But, granting this, it does not prove that the practice is right; the present case, on the contrary, points to carelessness and negligence in this matter being of more frequent occurrence than might be imagined. If there is damage, the consequences must rest upon those who deprived the main of a consistent flexibility in its length. So considered the Court; and judgment was given for the amount claimed, with costs. The case is of especial interest in these days when so much is being heard as to the security of street gas-mains.

Unemployment Grants to Assist Competitors.

THE cause of the unemployed is being utilized as an avenue for inflicting unfair competition upon the gas industry. Gas-mains have been laid by capital provided in the ordinary way by investors; in competition with that enterprise, electric cables are being laid to-day aided by subsidies from the Unemployment Grants Committee! It is all very well to provide temporary work for those who are unemployed; but it is not just to provide a permanent advantage, at the expense of the taxpayers, for one industry in its competition with another. But this is being done pretty considerably in the electricity supply industry. There are cases in which long lengths of mains have been laid by gas undertakings to outlying villages, and now electric cables are being installed along the same routes, which work would not have been entertained had it not been for the subsidies allowed by the Unemployment Grants Committee. An outstanding example of this unfairness is the Hackney scheme for the conversion of the public lamps from gas to electricity. Just lately Hackney has been indulging in some rather spectacular displays in connection with its electricity undertaking. According to published information, the scheme consists of the changing-over of about 3128 lamp-posts from inverted incandescent mantles consuming 3½ c.ft. per hour to electric gasfilled lamps taking 75 watts. It is calculated that the

additional electricity distributing mains which will be required will cost £145,000; the lamp services will entail an expenditure of £18,768; while the lamp-post equipment will cost £13,350, notwithstanding that the existing posts and lanterns will be used. It is stated in the report from which these figures are taken that "the Unemployment Grants Committee subsidy will be applicable so far as some 70 p.ct. of the total expenditure is concerned; and, *under these circumstances*, during the first five years the saving due to electrification will be £1161 per annum, and during the next five years £400 per annum. After that period the whole of the loan charges on [only] lamp-post equipment will have vanished. The saving will then be £2073 per annum during the next two-and-a-half years, and then up to the twenty-fifth year about £1500 per annum." These "savings" on loan charges will be to Hackney; the taxpayers of the country will have been instrumental in effecting them, and not any distinctive or direct merit of Hackney. It is grossly unfair to utilize public funds for one-sided assistance in the competition between two industries. It is said that, if there were no subsidy, the cost of the new lighting would exceed the present cost by only £173 9s. 2d. per annum, though the illumination will be increased by no less than 55 p.ct. The details showing how these figures are arrived at are of an occult order; apparently they are not intended for scrutiny by those competent in such matters. But with open mouths, *ipse dixit* assertions are received by the electrical Press; we prefer to have for examination the material upon which they are based before conferring upon them our full confidence. Certain are we that in this Hackney instance the electricity undertaking and not unemployment was the primary object in making application for assistance from the Unemployment Grants Committee. The nature of the work also means that the unemployed of Hackney will not benefit; but the ratepayers will have new obligations to bear. Such capital expenditure cannot be incurred otherwise.

Wembley Next Year.

At the Guildhall banquet on Monday evening, the Prime Minister stated that the Government were determined that the great enterprise of Wembley shall not come to an untimely end. Next year the Government will ask Parliament for a sufficient guarantee, in addition to that already promised, provided they get the support of all parties concerned as well as the Overseas Dominions.

Wembley Medals and Certificates.

From the first there was a preponderance of view that competitive awards should not be made for exhibits at the British Empire Exhibition. The Board of the Exhibition therefore resolved to amend their regulations, and to make a medal and certificate take the place of the usual competitive award. Each exhibitor who has rented space will therefore receive a medal, accompanied by a certificate of honour. Exhibitors participating in collective exhibits of products or manufactures in the United Kingdom or Overseas Governments, or in art and scientific research exhibits, organized by Governments, associations, and committees, will only receive a certificate of honour.

A Low Estimate of Value at Preston.

The Preston Corporation have been advertising for an official capable of filling three offices. They want someone who can be gas examiner, and test the quality of the gas in accordance with the requirements of the Gas Referees. He must also be capable of performing the functions of inspector of meters, and possess the certificate of the Board of Trade as to his qualifications for testing meters. He must also fill the post of lighting superintendent, in which position technical qualifications are required. This tripartite competence the Corporation propose to reward by paying the magnificent sum of £150 a year, *plus* Civil Service bonus, which at present amounts to £88 15s. 5d. There are certain road sweepers in London whose weekly wage would nearly equal that of this Preston Corporation official. It is observed that out of his yearly wealth he will be required to contribute to the superannuation scheme; and he must be physically (as well as mentally) fit, as he has to pass a medical examination. A sarcastic correspondent, in high position in these duties, thinks that the lucky individual who secures the appointment will get fat on the money, and his wife and family will be so splendidly clothed that they will be the envy of the people of Preston.

The Leicester Report.

The report of the Special Committee of the Leicester City Council on the relative positions of gas and electricity was the subject of comment in our editorial columns last week. The conclusions of the Committee do not appear to have a particularly good friend in "Meteor" of the "Electrical Times." In fact, it has stirred him into penning more of the silly brand of phrases anent gas to which his remarkably tolerant readers have become accustomed. He does not like a little bit the conclusions of the Committee; and, in his own opinion, he is a more competent judge than the Leicester City Council as to whether they should extend their gas-works. He foresees that Leicester "will be left far behind by other towns which are not devoting their energy to extending their gas-works." We are left wondering which are those towns. Manchester is putting up extensive gas-works at Partington; Glasgow has been engaged on a big scheme of reconstruction and extension; and so have numerous other large centres. In "Meteor's" view, are these City Councils equally foolish with the Leicester Corporation? It is curious that "Meteor" should know their business better than they know it themselves; but, of course, some individuals appraise their own views at a greater value than do other people. However, it is patent that the imaginative ideas of certain electrical men are furiously running riot against common-sense. It is, for example, a strange state of mind that allows a man to pen and publish such piffle as this: "There seems to be a general massed attack on electricity at Leicester; and, if propaganda be only sufficiently plausible and authoritative, there are always plenty of good souls who will suffer torture and disease in obedience to their convictions." We cannot clearly see the applicability of the second part of this foolish statement. Instead of criticizing, perhaps we ought to pity.

Gas Lighted Trains.

The sensation mongers have again been busy. We all sincerely deplore such a disaster as that which occurred to the London, Midland, and Scottish train near Lytham on Monday night of last week; but we do protest against newspapers like the "Daily Express," before knowing the true facts of the case, utilizing the occasion for an unwarranted attack on gas. In doing this it gives a list of eleven cases in which, during thirty-two years, gas is supposed to have contributed to the conflagration in train accidents. But in these instances there was no definite evidence that gas did anything to intensify the horrors of the accidents. There are plenty of means, besides gas, of igniting the dry smashed woodwork of railway carriages when an accident of this kind happens; and from fractured cylinders gas with high working pressures per square inch would soon be dissipated in the air, and would not linger around for the purpose of combustion. In this case the accident occurred not far from the new gas-works for Lytham; about which information was published in the last two issues of the "JOURNAL." In the course of the inquiry by Colonel Pringle, of the Ministry of Transport, the Assistant District Engineer for the Railway Company (Mr. Harold Morris) expressed the view that the fire on the wrecked train was caused by the fourth coach resting against the ruins of the demolished signal cabin, which had been set alight by the burning embers of the signalman's fire. There was the strongest confirmation of this by Mr. J. H. Ranft, Engineer and Manager of the Lytham St. Annes Corporation Gas-Works, who witnessed the accident from his office some 600 to 700 yards away, and to whose prompt action relief from the gas-works (in the shape of willing workers and tackle) and other quarters was quickly given to the sufferers. There were sincere thanks to Mr. Ranft by the Chief General Superintendent of the Railway Company (Mr. J. H. Fellows) and by Colonel Pringle. There was a smell of gas when Mr. Ranft arrived on the scene; but the gas-lamps were still alight in the ordinary way in the last two carriages. He, like Mr. Morris, was convinced the fire was started in the debris of the signal cabin. All reliable evidence points to the fact that gas had nothing to do with the fire.

Behaviour of Gas in Railway Accidents.

In the course of the evidence, some light was thrown on the behaviour of gas cylinders in accidents by Mr. Charles Mason,

the Railway Company's Divisional Carriage and Wagon Superintendent. Describing the condition of the gas cylinders after this accident, he said that there was no perforation of the cylinder in the leading vehicle, but the low-pressure pipe was cut through, and from it there was a discharge of gas at low pressure. On the second coach, the high-pressure connection was broken, and all the gas escaped in a few moments. This no doubt accounted for the smell of gas. On those two front coaches there was no sign of burning. On the third coach the cylinder was ripped open, and the gas escaped immediately. Naturally gas not in an enclosed place would dissipate itself in a flash. Only one coach was on fire, and that was the one in which the gas-fittings were intact, and the gas still burning normally. The sensation mongers in their desire to obtain something new have circulated their untruths about this matter; they have not disclosed the same eagerness to give equal prominence to the contradictory and authentic evidence. If, at the previous inquiries into railway disasters, there had been more technical evidence as to the behaviour of gas under high-pressure in such circumstances, there would have been a great deal less assumption in official and newspaper reports regarding the part of gas in such catastrophes, and less nonsense would have appeared in the daily Press.

"Coal and Power."

When politicians deal with matters of a technical nature about which they know little or nothing, they frequently talk the most arrant nonsense. When Mr. Lloyd George produced a book on "Coal and Power" which purported to be the report of a Committee (who were manifestly unqualified to treat of the subject), some remarkable things were said, and claims made, which declared the hand of the novice and not of the technician. We see that the Council of the National Association of Colliery Managers have passed a resolution to the effect that, if the proposals contained in the book were put into operation, they would have a disastrous effect upon the coal-mining industry, especially with regard to the administration, discipline, efficiency, and safety of the mines. Mr. Lloyd George and the Labour-Socialists should not attempt to interfere in matters which they do not understand.

Coal Miners' Wages—Next Year.

Mr. Herbert Smith, the President of the Miners' Federation, is Chairman of the Miners' International Committee. In that capacity, he has recently delivered an address in Brussels. In this he hinted at a new wages claim being made by the English miners on the termination of the present wages agreement on June 1 next year. He says the Federation have made good the loss of membership suffered as the result of the strike in 1921, and are still adding to their numbers. The full power of the organization, he adds, will be used to force higher rates of wages and to improve the status of the men, when the time arrives for re-opening negotiations.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Messrs. Ford's Motor Works, Trafford Park, Manchester.

On Wednesday, Nov. 5, about fifty members of the Association spent a very interesting afternoon at the above works. They were conducted round the extensive premises in parties of about twelve. The whole place is a triumph of organization from beginning to end. There seems to be one main stream of travelling conveyors with a number of tributaries. One travelling conveyor has several carriages or bogies to support the motor engine (already built-up). The engine, in its travel on the conveyor has first one part and then another fitted. At the end it is lifted off and placed on another conveyor, upon which is the chassis. The rear axle and universal joint are now added; and while the chassis is travelling (very slowly), the petrol tank is also added. The parts are all to hand overhead; and as they are taken down, others immediately take their place. There are about six men round the car, and each has his separate work to do. For example, as one man is fitting the wheels, another is fixing the petrol tank, and so on. Finally, the car is given a trial run.

The putting on of the tyres is a most interesting procedure; the actual operation being completed in two or three seconds. Great use seems to be made of compressed air for the driving-home of set-screws, nuts, &c. The workshops abound with machines for stamping-out the various parts. Most machines have their own motor for driving. The making of petrol tanks is a matter of only a few minutes.

PERSONAL.

Mr. J. FERGUSON BELL, M.Inst.C.E., of Derby, President of the Institution of Gas Engineers, has been apprised of his unanimous election by the Sixth Annual Convention of the American Gas Association, in session at Atlantic City on Oct. 14, as an honorary member of the Association.

Mr. SAMUEL TAGG, M.Inst.C.E. (Past-President of the Institution of Gas Engineers), has been appointed to the Commission of Peace for the Borough of Preston.

Mr. E. FROST, Engineer and Manager of the Narborough, Blaby, Enderby, and Whetstone Gas Light and Coke Company, Ltd., has been appointed Secretary to the Company.

Mr. WALTER DUNN, M.I.Mech.E., and Mr. W. A. TOOKEY, M.I.Mech.E., have been elected members of the Sub-Committee of the Informal Meetings of the Institution of Mechanical Engineers, the first of the new session of which took place on Friday, Oct. 31, at the Institution, Storey's Gate, Westminster, when the evening was devoted to a series of short papers and discussions on "Engineering Novelties at Wembley."

When referring in last week's "JOURNAL" to members of the new Parliament connected with the gas industry, omission was made of the name of Col. E. K. PERKINS, a Director of the Southampton Gas Light and Coke Company, who has been re-elected as one of the members for Southampton.

At the recent municipal election in connection with the Bolton Corporation, Mr. JOSEPH TAYLOR, Director of Messrs. Joseph Taylor (Saturators) Ltd., of Bolton, was again elected unopposed as a member of the Town Council. From 1910 up to the present time, Mr. Taylor has had no opposition.

Mr. JAMES CRAIG, who has been appointed to the Commission of Peace for Co. Antrim, was for many years a member of the Belfast Corporation and Chairman of the Gas Committee. In the latter capacity he was associated with important developments and extensions. Mr. Craig, who retired from civic life three years ago, has been for a considerable time a Justice of the Peace for the City of Belfast.

At the November Municipal Election, Councillor J. FERGUSON BELL, President of the Institution of Gas Engineers, was re-elected a member of the Derby Town Council for King's Mead Ward by a majority of 512 over his Socialist opponent. Councillor Ferguson Bell is Chairman of the Water Committee, and takes an active part in the work of the Council, of which he has been a member for some ten years. In addition, he represents the Derby Town Council, along with Alderman Dr. Bemrose and Alderman Wm. Hart, on the Derwent Valley Water Board.

OBITUARY.

One of the veterans of the gas industry, and one of the most respected late employees at the Hull Station of the British Gas Light Company, Ltd., passed away on Thursday, Nov. 7, in the person of Mr. FRANK MILNER at the age of 88 years. Mr. Milner entered the service of the Company in 1863, and in the year 1913, after fifty years of faithful and loyal service, was placed by the Directors on the Pension List. At the time of his retirement he was presented by his fellow workmen with a gold watch, as a sign of appreciation and regard. His conscientious loyalty to duty was a marked characteristic, and his memory will always be highly respected.

ELECTRICITY SUPPLY MEMORANDA.

THE new President of the Institution of Electrical Engineers is Mr. W. B. Woodhouse. In the professional ranks, his experience and work place him among the foremost. His position and personal capabilities enable him to take a broad and well-balanced survey of affairs; and this is shown in striking manner in his recent Inaugural Address to the Institution. The deliverance appeals to thoughtful and competent judges in the electrical industry as being as fair an exposition of the current and prospective situation as could be formulated by the existing advanced knowledge as to accomplishments and potentialities. But there are some folks who live in those ethereal regions where ideas take flight far beyond the limits set by mundane practicability. To the latter Mr. Woodhouse appears to be pessimistic. A man is not pessimistic because he draws a sane picture of the probabilities from a knowledge greater than that of his critics. According to the "Electrician," the President's Address "exhibits a certain fearfulness with regard to the future." We fail to see anything of the kind in the calm and dispassionate scrutiny presented in the address. Mr. Woodhouse is, wisely, strongly opposed to the application of exaggeration to the possibilities of electricity. But the philosophy of the "Electrician" is of a strange brand, and sadly illogical. Our contemporary says that "to deplore some exaggeration of the possibilities of electricity is not only to ignore the progress that has been made during the past twenty years—a progress to which in his address Mr. Woodhouse paid a glowing tribute—but to encourage a mental

The Advantages (?) of Exaggeration.

and physical inertia of which there is already too much among electrical engineers." We are tempted by this in the first place to ask whether it is necessary to exaggerate the possibilities of electricity. The exaggeration has been proceeding with a considerable amount of energy, and has got beyond the pale of what commonsense defines as practicable. Then on the confession of our contemporary, Mr. Woodhouse did not ignore the progress that has been made during the past twenty years, for he paid a "glowing tribute" to it. And, if we thought it was really true, we should be fearfully sorry for those electrical engineers who require the stimulus of "some exaggeration" to keep them from sinking into a state of "mental and physical inertia." In the same comment on the address, there are other gems. Here is one: "Claims for the use of electricity, preposterous though they may seem to the conservative, show an interest in the future, and, however far divorced from present expectations, exhibit a certain alertness of thought and a certain vision which it would be well to turn into the proper channels." Is there not any other way of showing a lively interest in the future than by presenting claims that are merely the product of imagination, and are unsupported by current knowledge or by any of the tests of a practical nature which can be applied? It is a bad and highly speculative outlook that requires us to pass beyond the region of known practicability to that where the visionary and exaggeration reign. But one other gem: "Often and often results of the greatest practical value have sprung from the most unpromising beginnings." To that may be added that often and often results of a most disastrous kind have sprung from the most unpromising beginnings. Fanatics there always have been, and always will be. They have been known to do grievous injury to otherwise good causes. Many people have laughed at the extravagances which individuals uncultured in these matters, or of quixotic ideas, have sought to attach to electricity supply.

Limitations.

When we turn to the address itself, more good sense is found than there is in the criticism of it to which attention has been directed. Mr. Woodhouse refers to the rapid increase of the industry during the past twenty years. But he adds that claims have been made for the use of electricity which exceed the present probability of fulfilment; and, in his view, the tendency to overstate the electrical case is likely to be harmful in producing a natural reflex of disappointment when the facts are known. There is no question as to electricity having a great future. As, however, Mr. Woodhouse says, it is not a panacea for industrial and social ills; and therefore it behoves engineers to speak out just as definitely when unjustifiable claims are made for it as when it is unfairly attacked. And then the deliberate statement: "The development of the use of electricity is limited by a consideration of the cost in relation to the cost of other means of supplying the same needs." Being an electrician, the President declares that electricity is the cheapest form of illuminant; and we happen to believe and know that incandescent gas lighting has a very legitimate claim to that position. But we are more interested in the President's considerations as to what are the limitations to its further use, and what is the probable development. He thinks it likely that less than 20 p.ct. of the houses of the country are wired; and one of the reasons for this small proportion is the cost of installation. In the natural order of development, those houses which could be most cheaply supplied have been dealt with first, and the supply to the others will involve proportionately greater distribution cost. Potentially, the dwellers in the smaller houses are more modest users of electricity; and because of this the cost of distribution per house is practically as high as for the larger users. This is not an encouraging consideration, and reduction could only be effected by stimulating the use of electrical energy for other domestic purposes. The present-day consumption per head of the population for lighting is about 10 KW.-H. per annum; but complete supply should produce figures of from 40 to 60 KW.-H. per head. There does not, in our view, appear much chance of electricity making any general headway in the field of domestic heating, simply because economically gas has a far superior place, and through the greater heating range that it offers, it possesses a larger convenience. By the way, we see that "Meteor" of the "Electrical Times" says: "The time has come to deal with the small consumer in his thousands. At present he does not pay for coupling up. Why?" The answer is not far to seek.

Heating and Carbonization.

In connection with heating, Mr. Woodhouse takes a broad view, and shows an intelligence which is not exposed very clearly by some of his professional contemporaries. He lays it down that the use of electricity for heating must take into account the particular requirements and the method of application before it can be said that it is the most suitable or the most economical method to adopt. Many of our electrical friends are very averse to the truth being told about electricity as a heating agent; and no doubt some of them, though themselves having the same knowledge, may say there was no need for the President to proclaim from his elevated position: "The adoption of electricity for general heating purposes is not probable until substantial and vital changes are made in the methods of production, and the supply engineer's thoughts must therefore be directed to the most suitable combination of means of heating, lighting, and power supply in dwelling houses and factories." This consideration leads the President to advert to the measure of co-operation which should be established between suppliers of coke, gas, or other fuel, and those of electricity. This is a matter that was dealt with extensively at the World Power Conference. The advantage which the suppliers of electricity obtained in the early days through the low price of small coal has almost entirely disappeared. Naturally, with the improved demand for it, the market price to-day is more in accordance with its heat value. Then again, electrical engineers are approaching the maximum economy in coal consumption; and therefore the President is of opinion that consideration should be given to the question whether the quantity of coal consumed is the true criterion, or if a process which, while consuming more coal, yet produces a greater profit per ton, is not to be preferred. With a coal distillation plant, there would be the marketing of the products which are not used for the primary business of electricity production. More coal, too, would have to be handled and treated than the quantity required for direct combustion. In the opinion of Mr. Woodhouse, this would introduce into the electricity supply business an element of speculation which is foreign to the industry as it exists to-day, and might alter substantially the nature of the industry, and the security it offers to the investor. There is no question that it would do so; for it is obvious that an increased production of the secondary products of coal carbonization would tend to depress market values owing to the output being in excess of the demand. It is also pointed out that gaseous fuel for steam raising has proved eminently satisfactory; but the special value of gas for distribution offers a market at higher prices. Coal gas, as produced from coke-ovens, is finding more and more an outlet in sale to gas undertakings. All these considerations point to a better co-ordination being required in the utilization of our coal supplies as between the two industries, and for the matter of that in domestic supply, for it is better to get in use (according to the operation) a 40, 50, up to 75 p.ct. efficiency from gas and 20 to 25 p.ct. from coke (with valuable products saved) than a mere 20 p.ct. from coal burned to ash, and all the valuable secondary products destroyed. We are not in sympathy with the adverse criticism of an address which invites electrical engineers to take a broader view than many of them have done hitherto.

Chastisement.

The blatant letter of Mr. L. L. Robinson, of Hackney, on the subject of the rules and regulations of the Institution of Electrical Engineers (noticed in last week's "Memoranda") has brought upon him a deserved castigation from some of his professional colleagues. His neighbour (Mr. F. W. Purse, of Stratford), says that if he were merely an outsider he should have judged from Mr. Robinson's latest outburst that he had lost all sense of reason and proportion. That being so, no one will blame us for criticizing the gentleman from Hackney. For him there are in Mr. Purse's letter some uncomfortable reminders. One is that he—now the critic—was a member of the Wiring Rules Committee until his retirement from the I.M E.A. Council. A second one is that the Council of which he was a member on several occasions not only strongly supported proposals in regard to the regulations (about which he is so cross), but have pressed for their compulsory enforcement. Mr. Robinson's letter is aptly described as a long diatribe about matters in general, but nothing in particular. Then a crucial question is asked: "Can Mr. Robinson state exactly what difference there will be in price by making a good installation under the regulations and otherwise?" A touch of sarcasm also emanates from Mr. Purse: "Even if it costs a little more, as electricity is the only thing to be considered in our lifetime, we want an installation to last our lifetime; and with all the wonderful advantages of 'Hackney electricity,' the initial cost must surely be of no importance." Then there is Mr. Llewelyn B. Atkinson, who, referring to Mr. Robinson's outburst, asks readers of his letter to consider the matter with a sense of proportion as an engineering and economic question. It has been alleged that in the regulations earthing has been dealt with in a drastic manner, that apparatus which complies does not exist, and that the requirements will add to the cost. To these complaints Mr. Atkinson's answer is that, if there is the demand, the apparatus will come into existence quickly enough, and the added cost is negligible. True it will in some cases add to the cost of the wire; but as this is a small proportion of any installation, it cannot be seriously contended that this will block progress. A hard knock is given when it is said that it is useless to burke the fact, that a 250-volt shock well administered is able to kill some individuals, while other individuals are unable to let go the hand grip. It is useless to say these apparatus are used on carpeted floors; they may be or may not—they cannot be marked: "Not to be used in a bathroom or washhouse." Earthing has been enforced by law in many cases in factories and mines. It is seen that there is a good deal to be said in opposition to the criticism of the regulations, which criticism has been mostly of a very general nature, and has kept some distance from positive and particular point.

Fatality at Hackney, and a Fire Elsewhere.

Speaking of Hackney, an inquest has been held in that district regarding the death of William Henry Banks (age 39). He died from shock received while putting a flexible cord electric plug into a wall. The current was 220 volts, alternating. According to the evidence, the man was standing in water, and both his boots and feet were wet. A verdict of "Accidental

death", was returned. The Sunday School building of the Park Street Baptist Church, Luton, was completely destroyed by fire last Saturday week. The reporter will probably be told he is a stranger to truth, inasmuch as he wrote: "The fire, which apparently had its origin in the fusing of an electric wire in an upper storey, rapidly demolished the match-boarded floors and wooden pews."

In Places of Entertainment.

In places of entertainment in the London area, the London County Council stand no nonsense from those who kick against a high standard of installation and maintenance work. They insist upon their regulations in this direction being observed; and they do so for that foremost of good reasons—the protection of the public. A report of the Theatres and Music Halls Committee which was included in recent agenda of the London County Council contained a section as to the rules to be observed. These provide that the lighting (internal and external), electrical, heating, mechanical, and other installations shall be in accordance with the Council's regulations. If there is an electrical installation, a "competent" person is to be in charge of it. Once within every fourteen months, a certificate by a qualified electrical engineer that the whole installation is in a safe working condition is to be submitted to the Council. We see, too, that at least one bucket filled with dry sand is to be kept in some accessible position near the main switchboard in each of the intake rooms, and in such other positions as the Council may consider necessary. There are also provisions as to temporary installations of gas and electricity. An important rule is that while the public are on the premises the lighting on each of two systems—two independent electric, electric and gas, electric and oil or candles, or gas and oil or candles—are to be fully maintained in all parts of the premises (other than the auditorium) to which the public have access. In all parts of the auditorium, sufficient illumination to enable the public to leave the premises safely is to be maintained on each of the two systems during the whole time the public are on the premises. Exits and other special points of lighting are also dealt with. The unreliability of electricity has, without express mention, large recognition in these regulations.

Residential Tariffs.

Reference was recently made to the residential tariff that has been applied at Newcastle-upon-Tyne. Electrical Distribution of Yorkshire, Ltd., have adopted one which is worked out on the basis of 12s. per room—36s. annually for houses not exceeding three rooms and 12s. per additional room, with a charge of 1½d. per unit consumed up to 25 units per room per quarter, and 1d. per unit for all in excess. All rooms are included whether or not electrically lighted, except sculleries not used as kitchens, bathrooms, halls not used as sitting-rooms, dressing rooms, and attics not used as bedrooms, box rooms, cellars, pantries, store rooms, and greenhouses not attached to houses, and outbuildings. Motors are charged either at £1 per H.P installed, *plus* 6½d. per unit, or £2 or £3 per H.P. installed, *plus* 2d. per unit for the first 3000 units per quarter, and 1½d. for all in excess of the 3000.

Caution to Investors.

The "Investors' Chronicle" publish useful "Cautionary Notes" for investors. A paragraph appeared on the 18th ult. dealing with a new registration—"Electricity Gas Share Debenture Investment and Guarantee Trust." This is what is said: "The pompous name of this new registration is in itself a warning to those accustomed to the methods of the less reputable among company promoters. There are other danger signals. The capital is one. It is £2000 in 1800 £1 non-cumulative preference 10 p.ct., and 4000 1s. ordinary shares. Indications of the connections of the Company suggest that this exiguous capital will be the basis of a so-called 'debenture' or 'bond' issue, of the type with reference to which so many warnings have been given here. The office is at 43, Cannon Street, E.C. This address has been associated with other dubious undertakings in the past. Among others of a similar kind to the present Company may be mentioned the Lighting and Power Finance Corporation, one of the names under which the company promoter Eaton has placed his wares before the public. Among his latest offers dealt with in these notes may be mentioned Electric Light and Power Contracts Finance Corporation and Warwickshire and South Midland Electricity Supply." The inventive powers of this group of promoters appear to be infinite.

Midland Junior Gas Association.—There is to be a visit of the Midland Junior Gas Association to the Smethwick Gas-Works next Saturday, the 15th inst.

Association of Gas Salesmen (Northern Area).—The next meeting of the Association will be held at West Hartlepool on Wednesday, Dec. 3, by invitation of Mr. A. W. Branson, Engineer, Secretary, and Manager of the Hartlepool Gas and Water Company. "An Afternoon with Bunsen Burners" will be the subject of an address by Mr. E. F. Craggs, of Newcastle, lecturer to the City and Guilds of London Institute Department of Technology. A comprehensive assortment of bunsens, large and small, will be dealt with, so that the afternoon should prove of much interest and educational value.

THE "S.B.G.I." PRESIDENT'S BADGE.

The presidential badge of the Society of British Gas Industries is of exceptionally well-conceived design, beautifully executed in silver gilt and enamel work. The ribbon clasp consists of the familiar representation of Britannia in a decorative setting. The official badge of the Association forms the centrepiece. The pendant medallion embodies a reproduction of the "Spirit of Coal"

recently familiarized by the fine poster produced for the British Empire Exhibition Gas Exhibit Committee by Septimus E. Scott. The linking of these three elements very fittingly symbolizes the enlistment of the "Spirit of Coal" in the service of Britannia through the medium of the Association.

The Illuminating Engineering Society.—The opening meeting of the session will be held on Tuesday, Nov. 18, at the Royal Society of Arts, John Street, Adelphi, at 8 p.m., when reports on important events during the vacation and on developments in lamps and lighting appliances will be presented.

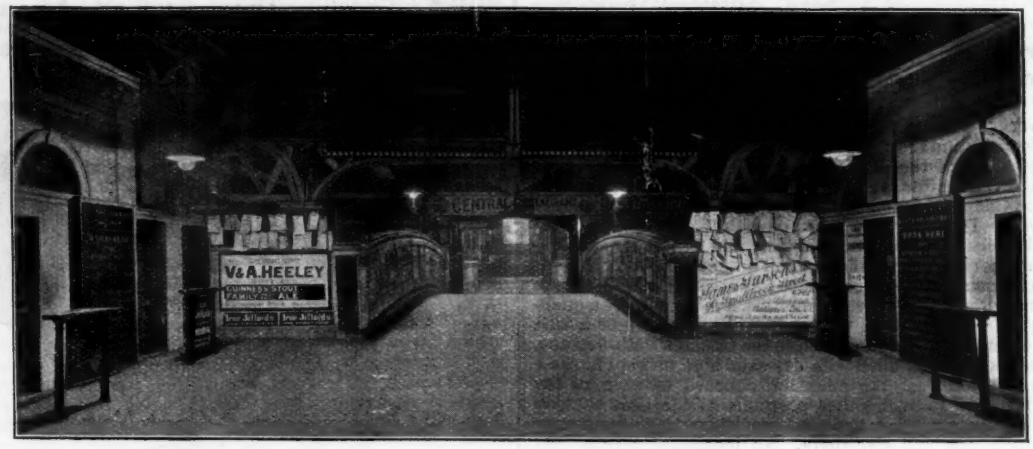
Landslide at Torquay.—When a landslide occurred at the Ilsham Drive, Torquay, recently, largely through the supersaturation of the ground, the gas and sewerage mains were fractured. Temporary connections have now been made, and it is hoped that the road will be repaired very shortly, and the drive reopened.

London and Southern District Junior Gas Association.—It was stated in error in last week's "JOURNAL" that a lecture would be given by Dr. H. Hartley at a meeting of the Association on Nov. 20. The date of the meeting, which will be held at the Westminster Technical Institute, Vincent Square, S.W. 1, is Friday, Nov. 28.

Yorkshire Junior Gas Association.—There is to be a meeting next Saturday (Nov. 15) in Bradford, at which Mr. E. Gillett will (at 4.15 p.m., in the Listerhills Schools) deliver his Presidential Address. This will be preceded by a visit to the Thornton Road Gas-Works of the Bradford Corporation, which the members will inspect under the guidance of the President and his assistants.

THE LIGHTING OF NEW STREET STATION, L. M. & S. RAILWAY, BIRMINGHAM.

A Striking Example of Gas Lighting.



VIEW OF BRIDGE, LOOKING TOWARDS MAIN ENTRANCE.

The scheme for the re-lighting of the platforms and bridge of New Street Station by gas is now practically completed. The work was placed in the hands of the City of Birmingham Gas Department by the London, Midland, and Scottish Railway, after full consideration had been given to both gas and electric schemes. A few details of the scheme, and the methods adopted for carrying it out, may be of interest.

Before the amalgamation of the London and North-Western and the Midland Railway Companies, the station was used by the two Companies; platforms Nos. 1, 2, and 3 being the L. & N.-W.R. side, and Nos. 4, 5, and 6 the Midland. The station is divided naturally into four portions—longitudinally by a roadway passing right through the station, between platforms Nos. 3 and 4 (thus dividing the L. and N.W. R. and Midland sides), and in a direction at right angles to this by an overhead footbridge leading from the main entrance over No. 1 platform right across the station to the farther side of No. 6 platform. This bridge, in addition to providing access from the street to all platforms, also forms an important means of communication from one side of the station to the other, and is extensively used by the general public as a highway, whether they have business on the station or not.

The L. & N.W.R. side of the station is covered by an arched roof of a single span of approximately 200 ft. The Midland side is covered by a separate roof of a shorter span. The height of the roof principals on the L. & N.W.R. side varies from 27 ft. 6 in. from platform level at the sides, to 38 ft. in the middle of the span; and it is from these principals that the lamps are hung.

A plan of the station is shown in fig. 1, which gives the position of the lamps over the platforms and bridge. It will be

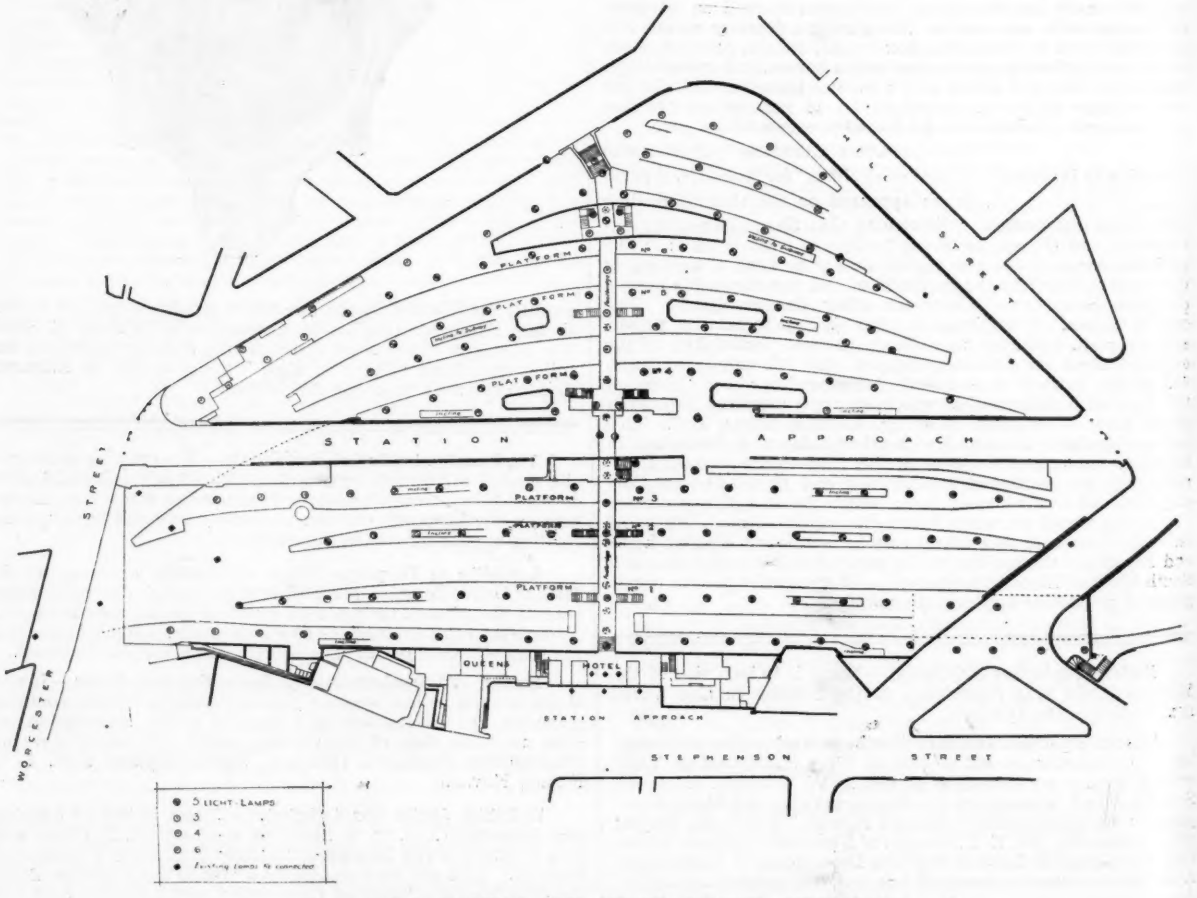
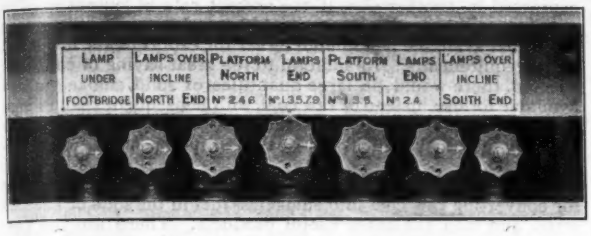


FIG. 1.—L.M.S. RAILWAY—NEW STREET STATION, BIRMINGHAM.
Plan Showing Position of Lamps.

observed that in general the lamps are hung in rows following the centre lines of the platforms, and along the centre of the bridge. The supply pipes rise from a position near the bridge on the platform level in each case to the height of the roof principals, and thence run right and left in the "up" and "down" directions respectively. Each pipe line is duplicated, and alternate lamps are connected to each, so that half or the whole number of lamps on each "up" and "down" platform can be turned on as traffic



Row of Control Cocks on No. 4 Platform.

conditions render this desirable. Four control cocks are fixed at platform level to control the four main supplies, and additional cocks for the control of other lamps under the bridge and in other positions. The lamps over each half of the public footbridge are controlled from central positions.

The lamps for the general lighting of the platforms are Sugg's 5-light "Littleton" lamps. The total number is:

2	8-light	lamps.	62	4-light	lamps.
6	6 ,,	,,	7	3 ,,	,,
109	5 ,,	,,	2	2 ,,	,,

Every lamp is fitted with the distant control device supplied by the makers. This allows of the turning on and off of the

South Staffordshire Bay.

View under Bridge along Stour Valley Bay.

Portion of No. 6 Platform under the Old System of Lighting.

lamps from the main control cock without the necessity of a separate run of pipe to supply the pilot lights, and, of course, avoids the difficulties in lighting occasioned by the main supplies not being always kept full of gas.

Over the platforms the lamps are hung at a height of 14 ft. from platform level to the mantles, and at a distance 48 ft. apart. The weight of the down rod and lamp is supported by alternate principals (the principals being 24 ft. apart).

This spacing of the lamps gives a degree of illumination at platform level shown by the curve in fig. 2. (This is corrected for angle of incidence.) A very important item in this connection was the necessity of avoiding too great a contrast between the lights for general illumination and the signal lights. It has been

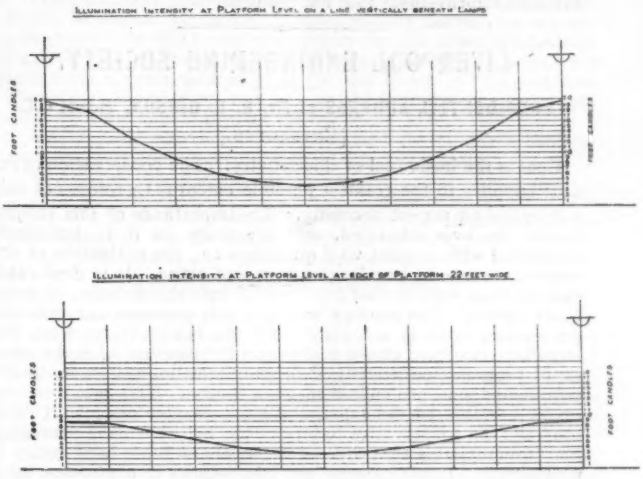

ILLUMINATION INTENSITY AT PLATFORM LEVEL ON A LINE VERTICALLY BENEATH LAMPS
FOOT CANDLES
ILLUMINATION INTENSITY AT PLATFORM LEVEL AT EDGE OF PLATFORM 22 FEET WIDE
FOOT CANDLES

Fig. 2.—Five-Light Cluster Lamps, 48 ft. Apart, 14 ft. High Corrected for Angle of Incidence.

necessary to shade a number of the new lamps in order to afford an undisturbed view of the signals by engine drivers. However, anyone who is familiar with the conditions of lighting under the old scheme will recognize the material improvement that has been effected under the new one.

The entire responsibility for the maintenance of the lamps is in the hands of the Birmingham Gas Department.

During the execution of the work, over 20,000 ft. of new piping was used. No girder principal or stanchion has been drilled or weakened in any way; all pipe work being secured by wrought-iron clips. Special precautions were taken during the course of the work for the safety of the workmen and the general public. All men working overhead were provided with body belts and

General View from Parcels End of No. 3 Platform.

No. 6 Platform under the New System.

life lines, and all tools secured by safety chains to avoid any possibility of persons beneath being injured. Strict instructions were issued regarding the crossing of the metals by workmen; and arrangements were made with the Company for flag men to be in attendance whenever working on the lines was essential.

The accompanying photographs give a good idea of the general lighting effect. They were taken during the small hours of the morning, when the traffic was at its minimum. One of No. 6 platform shows the type of lamps in use before the alteration, and gives a good idea of the general gloom which pervaded the whole station. The other of No. 6 platform, taken under exactly the same photographic conditions as regards time of exposure and plate and stop used, is a distinct contrast, and shows the material improvement that has resulted.

LIVERPOOL ENGINEERING SOCIETY.

PRESIDENTIAL ADDRESS of Mr. R. E. GIBSON, M.Inst.C.E.

[EXTRACTED.]

Coal is the basic fuel of this country. The conservation of our coal supplies to the greatest possible extent is therefore not only a duty but an urgent necessity. The importance of this subject cannot be over-estimated, and especially as it is intimately connected with another vital question—*i.e.*, the mitigation of the smoke nuisance in our large towns and cities. It is deplorable that, in these enlightened days, we tolerate the emission of dense black smoke. The prodigal waste of this precious and priceless possession, coal, is a legacy from the last century, when the abundant supply of cheap fuel enabled the nation to make such rapid progress industrially and commercially, and undoubtedly established our pre-eminence as a nation. This progress was made, however, at the expense of great wastage of coal. Unfortunately, the conservative habits of the Britisher have prevented him from realizing that this waste means ultimate bankruptcy if persisted in. Other nations, our competitors in commerce, have recognized the importance of coal conservation and have developed their own resources of fuel.

When raw coal is used for raising steam in boilers, even when fitted with the most efficient furnaces, continuously perfect combustion and uniformity of heating is not always attained, owing to the constantly varying physical and chemical qualities of the fuel and their effect on the size and intensity of the flames. Furthermore, the valuable bye-products contained in the coal are burnt or wasted up the chimney. In addition to the waste that takes place in the actual use of raw coal, there is also the cost of transport to be taken into consideration. This item forms a large proportion of the cost of coal at the point of delivery, and would be reduced in direct proportion to increased efficiency in use. The necessity for the extensive sidings and the large quantities of rolling stock now in use would be greatly diminished.

One is led to the conclusion that true coal conservation and smoke abolition can be attained only by the adoption of some system or systems of coal distillation which will give high thermal efficiency and provide: (*a*) Solid smokeless fuel. (*b*) Gaseous fuel. (*c*) Fuel oil. (*d*) Motor spirit. (*e*) Tar products. (*f*) Fertilizers, &c.

For ship propulsion, heavy motor transport, and the generation of electricity, solid smokeless fuel might be extensively used. Fuel oil (mainly from petroleum) is already used largely for ship propulsion and other power purposes. For domestic and industrial use, gaseous fuel or some form of free-burning coke are two alternatives. Gaseous fuel is easily distributed by pipes; no storage is required; labour costs are reduced to a minimum; the supply, being on tap, is under perfect control; and there is no waste, as it is shut off when no longer needed. The required temperatures can readily be obtained and maintained. Combustion can be applied locally or spread over large surfaces. For purposes where uniformity of heating and control of temperature are required, gas is an ideal fuel.

A brief survey of the general position to-day with regard to our coal supplies may be of interest. The total output of coal in England, Scotland, and Wales during the year 1922 was 249·6 million tons. This huge quantity was disposed of as follows:

	Millions of Tons.	P.Ct. of Total.
Export	64·2	25·7
Industrial	69·1	27·7
Domestic fuel	43·8	17·5
Transport (by land and sea)	35·9	14·4
Gas-works and coke ovens	29·8	12·0
Electricity stations	6·8	2·7
	249·6	100·0

An examination of the above table reveals the fact that 25 7 p.ct. of our output went out of the country. Of the remainder, 62·3 p.ct. was burnt in the raw state, and only 12 p.ct. was scientifically treated for the production of smokeless solid and gaseous fuel and the recovery of bye-products.

The disposal of the country's output of coal could be so reorganized as to allow of a large proportion being scientifically treated, and thus made to go much further in meeting all the needs—domestic, industrial, shipping, &c.—while at the same time eliminating black smoke, recovering tar, oils, motor spirit, fertilizers, &c., for a variety of purposes. According to Sir Richard Redmayne, formerly Chief Inspector of Mines, the total quantity of coal available in Great Britain and Ireland, adopting a depth of 4000 ft. and a minimum thickness of 18 in. as the limits of practicable working, is 127,000,000,000 tons. At the present rate of output this quantity will be exhausted in about 500 years.

If only half this quantity were treated by processes of carbonization, there would be a far greater yield of heat units at the point of use than at present, and the country's coal resources would last at least twice as long as under the present wasteful methods; or, expressed in another way, if the present rate of output were to continue as it is to-day, there would be at least 125 million tons more coal available per annum either for export or for increased home requirements. In addition to the great saving of coal thus effected, there would be large quantities of solid smokeless fuel available for use instead of raw coal, with consequent reduction of the smoke nuisance. There would also be produced vast quantities of motor spirit, fuel oil, heavy oil, pitch, sulphate of ammonia, &c.

Several different processes of carbonization are now in existence for converting raw coal into smokeless fuel in the solid or gaseous state, and into the other useful products. There are the gas-works processes of carbonization in horizontal or vertical retorts, total gasification, coke-oven practice, and low-temperature carbonization, giving varying yields of gas, solid smokeless fuel, tar, motor spirit, creosote, fuel oil, pitch, sulphate of ammonia, &c. In the total gasification process the whole of the coke is converted into water gas or producer gas.

Each of these processes has its own distinctive advantages, and each may be specially suited to its own peculiar conditions; but in all of them the thermal efficiency is high and the economies are great. However efficient a process may be, it must also be financially sound and a commercial proposition if it is to be a success.

Of the five systems just referred to, three are in extensive use—viz., carbonization in horizontal retorts, in vertical retorts, and in coke ovens. It may therefore be assumed that they are sound from a financial point of view. Total gasification has been in considerable use during and since the war, and is largely the outcome of conditions arising in consequence of the war. Low-temperature carbonization has not yet been carried out on a very large scale, and will depend for its commercial success mainly on the prices at which the products—and particularly the free-burning coke—can be sold. At Glasgow a large installation of Maclaurin producers has been erected for the purpose of supplying a solid smokeless fuel suitable for domestic use, the gas evolved in the process being utilized as fuel for the boilers of the electricity generating station. It will be interesting to see how far it will succeed.

Probably a way will be found eventually whereby a modified system combining some of the advantages of each of the processes mentioned can be utilized, which will prove to be efficient, economical, and a commercial success. The Fuel Researd Board of the Department of Scientific and Industrial Research have for some time been experimenting with low-temperature and other processes of coal distillation, and much valuable information has already been obtained. In this connection we are to be favoured with a lecture a fortnight to-day by Dr. Lander, Director of Fuel Research, which will deal with the subject of low-temperature carbonization.

An essential condition of success in connection with the adoption of carbonization instead of direct combustion must be the finding of markets for the products at prices which would prove remunerative. The substitution of coke for coal could be gradually brought about by the use of specially-designed furnaces and grates, and would result in increased efficiency. The coke should be worth rather more than coal as a fuel, by reason of the more complete combustion that can generally be obtained. Coke is being used to an increasing extent for steam-raising, and also for the production of producer gas and water gas for power and heating purposes. There is also a growing demand for it as domestic fuel and for heating public buildings, institutions, &c.

If coke of a freely-burning quality (such as Coalite) were produced at a reasonable price, its use would quickly extend; and there appears to be good reason to hope that in the course of a few years raw coal will be entirely superseded for most purposes. For domestic and many industrial purposes gaseous fuel has many great advantages over any form of solid fuel. By its use transport is obviated. There are no ashes, no dust, and no labour; while complete control is secured by the turning of a tap. The calorific value being constant, uniformity of heating is secured. Heat is available at a moment's notice. In the domestic sphere, for cooking and hot-water supply, as well as for fires, its use is being rapidly extended, while gas for lighting is appreciated by many for its soft quality of light and absence of glare. The extension of the use of gas has the effect of reducing its price; the standing charges being spread over a larger output. The application of town gas to industrial purposes is also growing. The great convenience of having heat on tap without involving any capital or labour charges thereon is being more fully appreciated.

When considering the question of cost, if the whole of the indirect savings are taken into account, gas, when compared with raw coal, is generally found to be the cheaper. There are other directions in which the coal resources of the country can be conserved. For example, methods can, and should, be found which would utilize the large quantities of poor coal and coal dust which are not now used at all. This inferior fuel should be dealt

with at or near to the collieries, to avoid transport charges on the large proportion of useless matter in the form of incombustible ash and dirt contained in the coal. Even in much of the coal that is now used the ash content could be greatly reduced by washing and cleaning before the coal leaves the colliery.

The gas industry of this country is doing much towards the conservation of the coal resources of the nation. It is providing a great public service in supplying gas to practically every home, and is also contributing in no small degree to the health and general well-being of the community by greatly reducing the smoke evil. What is now being done, however, is small in comparison with what should be done if the ideal is to be attained.

According to the latest Board of Trade returns, there are 790 authorized gas undertakings in Great Britain carbonizing 16½ million tons of coal and gasifying 43 million gallons of oil per annum, from which are produced 260,000 million c.ft. of gas, 11 million tons of solid smokeless fuel in the form of coke, 182 million gallons of tar, and 117,000 tons of sulphate of ammonia. The gas is supplied to 7,800,000 consumers through 41,000 miles of gas mains. Coke-oven gas is being used to an increasing extent for town supplies; Sheffield, Leeds, and Middlesbrough being the chief towns availing themselves of this source, being in close proximity to the collieries. The quantity of coke-oven gas now being used for town purposes is only a small fraction of the total quantity made; and considerable economy could be effected by its more extensive use. Co-operation and co-ordination will be necessary not only between the owners of coke ovens and the gas industry, but between these two bodies and the electricity industry, if coal conservation is to be carried out to the fullest possible extent.

Some idea of the extent of the operations of the Liverpool Gas Undertaking and its growth may be gathered from the following particulars.

The area of supply of the Liverpool Company extends along the river side for a distance of 15½ miles, stretching from Garston in the South to the River Alt, near Formby, in the North. It is nearly 6 miles wide at the widest part, and the total area to be supplied will be 57 sq. miles when the Hightown area, now the subject of an application to the Board of Trade, has been added.

There are six manufacturing stations; the two largest being Linacre in the North and Garston in the South. The original Company commenced in a small way in the year 1816. In 1822 the quantity of gas sold per annum had risen to 27 million c.ft., and the price was 45s. per 1000 c.ft. The output last year was 7000 million c.ft., and the price is now 2s. 11d. per 1000 c.ft. (7·4d. per therm). The revenue for the year ended Dec. 31, 1923, was £1,452,313. The number of workmen employed, including the staff, is 2516, and the mains extend to a length of nearly 1000 miles.

In addition to the large output of gas just mentioned, there are produced: 232,175 tons of smokeless fuel in the form of coke and breeze, 3096 tons of sulphate of ammonia, 4,237,241 gallons of tar, from which a large variety of secondary products are obtained. Other direct products are: Retort carbon, ferro-prussiate of soda, and spent oxide of iron, containing sulphur, which is converted into sulphuric acid.

By the Liverpool Gas Act of 1914 the statutory quality of the gas was altered from an illuminating to a calorific standard, to meet the changed conditions; and by the Gas Regulation Act of 1920, charging for gas by the therm became compulsory, the quality declared by the Liverpool Company being 475 B.Th.U. per c.ft. We have heard much lately concerning super-power stations for the generation of electricity; but one never hears of super-gas stations, though such are in existence—as, for instance, at Beckton.

There is an economic limit, however, to the area to be supplied by any one station, on account of the heavy expense involved in laying mains.

So far as power schemes have been considered on a national basis, there has been no really effective attempt to look on the fuel and power industry as one big problem. If nationalization of coal and power supplies is ever established, there will be need for a central and impartial authority which would take a comprehensive view and look at every phase of fuel consumption and the conversion of potential into the various forms of kinetic energy. Only in this way can full advantage be taken of the most efficient methods and production at the lowest costs, thus yielding the greatest benefit to the nation.

"The Failure of State Railways."—A new pamphlet bearing this title has been written by Mr. Harold Cox, the Editor of the "Edinburgh Review" and an authority on economics. The careful reasoning and lucid writing which are characteristics of Mr. Cox's work are once more evident; and the little book will be read with great interest. It is published by Messrs. Longmans, Green, & Co., No. 39, Paternoster Row, London, E.C.4, and the price is 6d. net.

Institution of Gas Engineers.—The Institution have been advised that an extra meeting of the Institution of Civil Engineers will take place on Thursday, Dec. 11, at 6 p.m., which members of the Institution of Gas Engineers are invited to attend. A paper by Captain H. Riall Sankey, C.B., O.B.E., on "Standards of Comparison in connection with the Thermal Efficiency of Steam Engines" is to be submitted for discussion. Tea will be served in the reading room at 5.30 p.m.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION—AUXILIARY SECTION.

Half-Yearly Meeting.

The Eleventh Half-Yearly Meeting of the Auxiliary Section of the North of England Gas Managers' Association was held on Saturday afternoon, Nov. 8, at the works of the Walker and Wallsend Union Gas Company, Howdon-on-Tyne. Mr. W. BATT, jun., Newcastle, presided over a good attendance.

The CHAIRMAN proposed that Dr. Geoffrey Weyman, of Newcastle, be elected Chairman of the Auxiliary Section for the ensuing year. He said it was unnecessary for him to say much about Dr. Weyman, as they were all well acquainted with his work. He had done a great deal of good for the North of England Gas Managers' Association, and he thought that his election would meet with the approval of all the members.

Mr. W. L. ROBERTSHAW, who seconded the proposal, thought the members would heartily support this nomination.

The motion was carried unanimously.

On the proposal of the CHAIRMAN, seconded by Mr. ROBERTSHAW, Mr. G. E. Anderson, of the Walker and Wallsend Union Gas Company, was elected a member of the Committee.

Mr. G. E. ANDERSON then read a paper on

RANDOM NOTES ON WORKS TOPICS.

In response to a request by our Secretary for a paper on general works topics, I propose to touch briefly on one or two of the more debatable points occurring in ordinary works practice, giving examples of the procedure adopted at the Howdon Works, in the hope that these will afford a subject both for comparison with the routine at your own works, and also for a full discussion at the end of the paper.

The subject of works practice offers an unlimited field both for theoretical reasoning and for practical experiment, and the trend of recent progress shows that both these aspects are being thoroughly explored. Those of us who are engaged on the works side realize that our duty is to manipulate the plant at our disposal not only in such a way as to obtain a maximum yield of therms per unit of plant and per ton of coal, but also in such a way as to reduce to the lowest possible figure the cost of each therm available for distribution, and to deliver our chief product under adequate pressure into the distribution mains, and as free from impurities, and at as near a constant calorific value, as possible. The Gas Regulation Act of 1920, by virtue of the new standards it has created and the constant official testings which it prescribes, has accentuated this responsibility; and it is partly due to this, and partly also to the comparative disorganization left by the war, that the results in most works have shown a tendency in recent years to steady improvement, from both the technical and the financial standpoints. Retort-house operations, in view of their fundamental influence on the efficiency of the works as a whole, have naturally been subjected to critical supervision, with a consequent tightening-up of conditions, in the course of the hunt after the therm, which experience has shown to be considerably more elusive than its predecessor the cubic foot.

I trust it will not be enlarging too much on the general aspect of the subject we have to consider, if we ask whether in many cases we are not too easily satisfied with our results, so long as the routine in the retort house and elsewhere goes on smoothly. The organization of past years is apt to become a habit; and any changes, however small, appear to assume large dimensions when they mean the scrapping of established custom. It is not to be thought, however, that every change brought about will guarantee improvement; and in many cases it may be found, after experimenting with various alternatives, that the old-fashioned way is the best. This has often been our experience at Howdon; and some of our procedure may consequently be considered a little out-of-date in the light of modern developments.

RETORT-HOUSE OPERATIONS.

As mentioned in the pamphlet giving a summary of the plant at these works, our retort-house installation comprises 22-in. by 16-in. by 20-ft. through horizontals in settings of eight retorts; and our practice in the past consisted of burning-off 10½ cwt. charges in eight hours, any reduction in the output required being met either by transferring one or more beds to 12-hour working, or by standing beds off in the usual manner. Under certain conditions both carbonizing periods possessed definite disadvantages. The efficiency of the 8-hour charge was largely dependent on the quality of the coal being carbonized, inasmuch as with poor coals difficulty was occasionally experienced in completely burning-off the charges, while the producer, fitted with the old angle-bar grates, and fed for the time being with coke containing a high percentage of ash, did not provide a sufficient reserve of heat to compensate for the frequent cooling of the setting brought about by the charging. Good results were obtained, however, with good coals. The disadvantage of the 12-hour charge as an alternative standard lay in its effect on the capacity of the plant, and also in the increased coke consumption as compared with the 8-hour charge. The first remedy tried was to regulate the weight of coal charged according to the heat observed in the bed, but this was soon discontinued for two reasons. First, the average weight per charge was considerably reduced all round by the men,

and a convenient excuse was ready to hand when an abnormally light charge was discovered; secondly, it prevented the possibility of uniform charges and consequently uniform working. Further consideration of the problem next showed that the average 8-hour charge occupied only 55 p.ct. of the available space in the retort, as against 66 p.ct. which has been defined as representing a heavy charge. A standard 10-hour carbonizing period was therefore adopted, thus providing a sufficient margin for the necessary increase in the weight per charge. Incidentally this margin, representing a 25 p.ct. increase in time, as against a 20 p.ct. increase in coal, provided, at least on theoretical grounds, a decided tendency towards the elimination of badly burnt-off charges. In practice, the best weight per charge, taking all factors into consideration, has been found to average 12·1 cwt., representing 64 p.ct., which means considerably over two-thirds of the actual retort space, taking into account the extra thickness of scurf—viz., 2 to 2½ in.—adopted as a standard at these works. The increase in the weight per charge was brought about gradually for the purpose of observing the effect on the stoking machines; trouble in this respect being generally experienced, more especially in the case of old retorts, when attempting charges heavier than the present standard. Another difficulty we expected was in reconciling the 10-hour charge with the 8-hour shift; but apart from the posting of a simple record of retorts due on the first draw of each shift as it came on, no extra arrangements were necessary, and even this was discontinued after a few days.

In comparison with our previous method of working, the 10-hour charge tends in many ways towards better results, in so far as partially burnt-off charges have practically been eliminated, while working heats and weight of coal per charge can be maintained with very much greater regularity. The gradual increase in the latter factor has been accomplished by a corresponding increase in the average gas yield per charge from 6000 to 7350 c.ft., representing an increment of 22½ p.ct. for a 15½ p.ct. actual increase in coal. This is, of course, equivalent to a higher make per ton, and is probably accounted for by the better burnt-off charges, in conjunction with the extra time the coal is allowed to remain in the retort. In estimating the effect of the change to ten hours so far as the gas yields are concerned, any variation in the quality of the coal must naturally be allowed for. The average coal analyses, calculated in each case from a very large number of daily samples taken from the mixed coals fed into the overhead hoppers, are consequently shown below, and it will be noticed that the difference does not amount to much.

—	8-Hour Charge.	10-Hour Charge.
Moisture	2·94	2·33
Volatile matter	28·76	28·53
Fixed carbon	55·71	59·16
Ash	12·59	9·98

Probably the most important advantage resulting from the adoption of the 10-hour charge has been the reduction, so far as stokers' wages are concerned, in the carbonizing costs per therm, brought about by the increased thermal output per charge; the number of charges handled per man remaining the same. As the therm output per charge has been increased from 33 therms on eight hours to 40·4 therms on ten hours, for the same labour costs, it will be noticed that the reduction is fairly considerable. To this must be added the fact that fewer charges are required for a definite daily, monthly, or yearly output (amounting in our case to a decrease of over 10,000 charges per annum), thereby reducing the wear and tear on the machines, and shortening the time taken by the draws. The only disadvantage which our experience of the new system has brought to light is a slight decrease in the capacity of the plant; the therms per retort per day being reduced from 99 to 97 on the basis of good normal working in each case. Though this difference is known to exist, it is hardly noticeable under practical working conditions; and owing to the possession of spare plant, even under mid-winter conditions, we do not consider it a serious drawback, for it is outweighed many times by the advantages. In view of the foregoing points, the writer would venture to suggest the 10-hour carbonizing period as worthy of careful consideration in those cases where 22-in. by 16-in. retorts are at present worked on 8-hour charges, though it is clearly realized that under the totally different conditions possibly existing at other works the system might not justify itself. So far as our own case is concerned, further experiments are now being carried out with segmental silica retorts, for the purpose of showing conclusively whether or not the extra thermal conductivity at high temperatures warrants a return to the shorter carbonizing period without loss of efficiency.

Regarding working heats, our average has been maintained fairly constantly at 1450° C. While this temperature more or less guarantees the complete evolution of the volatile content of the coal, it demands a constant supervision in order to prevent mishaps, and further tends towards ascension pipe troubles and low tar yield. For this reason we have recently reduced the heats all round by approximately 50° C., in order to observe the effect. Up to the present it has been noticed that the gas yields remain very much the same, after allowing for any difference in the coals, though the period has been too short to speak with any degree of certainty. Regarding thermal yields, our average has been in the neighbourhood of 66⅔ therms when using coals giving a laboratory analysis as shown previously. This figure leaves room for a good deal of improvement, but the comparatively low volatile content of the coals carbonized is probably responsible for this to a certain extent. Calculating in strict proportion, if this is admissible, shows that the yield with a 30 p.ct. volatile coal would be exactly 70 therms. In this connection it is interesting to note that more recent working with coals testing 1·0 p.ct. higher in volatiles has yielded an average of 68·3 therms over a period of two months.

In considering thermal yields it is important to remember that, while from a technical point of view a yield of 70 therms is a desirable ideal, yet, from a commercial point of view, a lower yield often provides a cheaper therm. Though attention has often been drawn to this point, it nevertheless remains very much in the background. Of the three main factors determining the cost per therm—namely, net cost of coal, repairs to plant, and carbonizing wages—the first two tend to increase with a high yield, in view of the reduction in coke, and extra wear and tear respectively, while the last-named is more dependent on yield per man than yield per ton. The determination of the economic relationship between these factors is an important problem, and in so far as it depends on the fluctuations of the market for residuals, it is liable to constant variation. Where it is possible to take advantage of these fluctuations without inconveniencing the consumer, the responsible works official should endeavour to do so. He can at any rate reduce his costs by the disposal of his labour in the retort house to the best advantage. At Howdon, the labour has been standardized at 16 charges per man per shift, which, with the present working and wages, resolves into a yield per man of 660 therms per shift at a cost of 0·189d. per therm. This figure has been realized over the period of two months referred to above, and includes charging, discharging, pipe cleaning, coke quenching, and depositing into overhead hoppers, but does not include cleaning fires and supervision.

Coke Consumption.

From the point of view of cheap therm production the question of coke used per ton is of almost equal importance to that of gas made per ton. Figures giving the coke consumption at so many pounds per 100 lbs. of coal carbonized or per 1000 c.ft. of gas made are rather difficult to determine with any degree of accuracy under ordinary working conditions; and a more rational standard of efficiency is undoubtedly the figure for coke available for sale. In the case of a straight coal gas installation, this figure depends on the coke consumption in the producers and works boilers, and also on the arrangements made for the prevention of excessive breeze formation. Referring to Howdon practice, the coke sold averages 11 cwt. per ton, reckoned on the twelve months ended June, 1924; this figure applying to coke only, there being no breeze available for sale, and scarcely enough for the works requirements.

The amount of coke available for sale has been modified in many works recently by the introduction of plant for recovering combustible matter from the pan ashes. This proposition has been considered at these works together with the alternative idea of attempting to reduce the percentage of this combustible matter; a fair degree of success having been achieved in this direction by a slight alteration to the design of the step-grate furnaces. Comparative tests between the efficiencies of the angle bar grate and the step grate showed that, whereas clinkering troubles were largely eliminated in the latter, the percentage of unburnt coke had a tendency to be higher, owing to cleaning difficulties and the existence of a certain amount of dead fire at the back of the pan. Our idea was to combine the two types in such a way as to obtain the advantages of both; and by removing the bottom tray and substituting a notched channel supporting angles stretching to the back wall, and resting at that point on a 2-in. square bar built into the side walls, this object has been largely attained. The main advantage of this arrangement comes about during the "shaking up" of the fires; for by removing the angles, one or two only at a time, the ash can be removed quickly, and the bars reinserted before the coke drops down in any quantity. Further, the whole of the fuel bottom is kept in a lively condition.

In cleaning the producers, though we have attempted with fair results to discard false bars, the use of which has become extremely unfashionable of late, we find it pays better to spike at 48-hour intervals, in preference to constantly shaking up every three or four hours. In the writer's opinion, it is this constant shaking up which is to a very large extent responsible for the high percentage of unburnt coke in the ash removed from the retort house. Even though this coke is recovered mechanically in some cases, the necessity for its double handling is best avoided. In our case we shake up every twelve hours; and the putting-in of the false bars every other day, while taking up very little longer time than a shake up, results in the maintenance of the fire in a clean and lively condition, thus preventing the possibility of poor heats due to a dirty producer. With this method of working, and the arrangement of the furnace grate described, recent tests with the pan ash give an analysis as follows:

	P.Ct.
Coke	13·2
Breeze	1·5
Clinker	15·8
Ashes	35·0
Fine dust	34·5.

The greater part of the coke is at present picked out by hand; this work occupying part time for one man, who is also responsible for loading the ashes into railway trucks, and filling tar tanks. As mechanical separation would only yield the extra

1½ p.ct. of breeze, with probably the same labour costs as at present, we do not consider it a profitable proposition.

COKE QUENCHING.

One of the disadvantages under which horizontal retorts labour is the question of quenching the red-hot coke after discharge. The waste heat from this source is not recoverable except by comparatively complicated plant, and quenching by town's water is apt to become a costly process. Most works have adopted some method of economizing in the cost, either by using the minimum of water to the best advantage, or by arranging for the re-circulation of the water. The latter idea has been adopted at Howdon in conjunction with a rather ambitious reservoir scheme for displacing town's water altogether, so far as quenching is concerned. This was evolved owing to the existence of a plentiful, though intermittent, supply of field drainage water running into the works main drains near the sidings. Observations kept on the rate of flow showed that after particularly wet weather the volume reached a maximum of 50,000 gallons a day, and diminished to little more than a trickle after a period of sustained dry weather. In order to obtain the full benefit from this source, a concrete puddle-lined reservoir measuring 100 ft. square (outside dimensions) was constructed, complete with filters. This work constituted something in the nature of spare time employment, filling in the intervals between coke orders, purifiers, and other routine jobs. With the exception of encountering running sand, which necessitated rather deeper excavation than was originally intended, the work was straightforward. Advantage was taken of the natural earth backing on practically three sides, and the pronounced slope of the land enabled the level to be kept sufficiently high to permit of a fall to the pumps, situated on the clinkering floor in the retort house; the drainage water being collected at a higher point into a common feeder and conveyed to the filter beds. The scheme was further extended by the collection in the reservoir of all roof drainage and suitable waste water. In working, the water is pumped at a pressure of 50 lbs. per sq. in. on to the coke travelling along the hot-coke conveyor, and is afterwards collected in a brick filtering chamber under the stage floor, and overflows to an underground sump, whence it is transferred back to the reservoir filters. Apart from the starting-up of the electrically-driven centrifugal pump delivering on to the coke, the whole system is automatic; the second centrifugal pump delivering back to the reservoir being started and stopped by a float switch. Town's water is thus entirely eliminated, so far as coke quenching is concerned; and it is interesting to note that the total saving in the consumption of water for a period of twelve months after putting the reservoir into commission was 10,810,000 gallons, representing a reduction of 49 p.ct. Moreover, the quantity of water available is more than sufficient for coke-quenching purposes, and consideration is being given to the possibility of putting the surplus to other works uses—as, for example, on the condensers, &c.—which will result in a further considerable saving.

REGULATION OF CALORIFIC VALUE.

Once the calorific value is declared it becomes the duty of the works to maintain this value as closely as possible, not only as far as the quarterly average is concerned, but also in respect of the daily and hourly send-out. The facility with which this regularity can be maintained depends to a large extent on whether the declared calorific value is a suitable one, taking into consideration the plant at disposal. So far as the position at Howdon is concerned, the plant consists entirely of horizontal settings manufacturing straight coal gas, and therefore typical of many other medium-sized works; but the method of regulating the calorific value is perhaps not so common, and consists in working the benzole plant not so much with the idea of reaching a high efficiency so far as benzole extraction is concerned, but rather with the object of equalizing and regulating the quality of the gas. The declared value of 525 B.Th.U. gross was adopted as the result of prolonged tests carried out for the purpose of finding what value was most economical and at the same time could be maintained with reasonable regularity over long periods; and its suitability may perhaps be best illustrated by the following table giving the whole of the official testings for calorific value for the twelve months ended last June.

3rd Quarter, 1923.	4th Quarter, 1923.	1st Quarter, 1924.	2nd Quarter, 1924.
532	527	533	525
536	523	526	527
517	529	523	530
525	519	526	530
524	530	531	527
526	522	524	525
531	534	521	523
526	528	525	527
528	528	530	526
530	530	526	523
527	531	526	526
525	528	527	525
526	526	524	534
Aver. 527·2	527·3	526·3	526·8

It will be noticed that the greatest deviation from the declared value is + 11 B.Th.U.; 81 p.ct. of the tests came within 1 p.ct. of the declared value, while 56 p.ct. fall within ½ p.ct., as does also the quarterly average in each case.

The gas leaving the retort house has an average calorific value of about 550 B.Th.U.; the variation being from 520 to 580 B.Th.U. A recording calorimeter situated in the exhauster house and supplied from the inlet of the benzole washer provides a continuous record of the make, for the purpose of showing when modifications are necessary both in the retort house and on the benzole plant; the 550 line being distinctly marked in green. This calorimeter is checked twice daily by means of a Boys standard instrument off the same supply, and any differences are allowed for. Actual modifications of normal working are surprisingly few, in view of the regularity possible in the retort house under the 10-hour system of working, as previously described. When required, these modifications can be made either in the retort house or in the benzole plant, or in both. Consequently powerful control can be exercised in keeping the variations in the send-out within narrow limits. Greater regularity is also helped by our practice of keeping the holder in the bottom lift as much as possible, thereby obtaining a considerable steadying effect. This policy naturally lengthens the time necessary for any alterations to make themselves felt, and a Boys instrument or recording calorimeter fed from the outlet of the washer should theoretically afford a means of keeping still closer to the declared value; but in view of the results obtained at present, the cost of an extra instrument is only doubtfully justified. Where multiple holders are available an instrument so placed would undoubtedly prove useful, as a knowledge of the quality of the contents of each could be obtained and utilized by compensating high-value gas from one holder by low-value gas from another when necessary.

The scheme has, in common with most other schemes, certain disadvantages; but up to the present these have not been found to have any serious effect. In the first place, should the benzole plant be shut down, the calorific value necessarily rises considerably. Our experience on this point has been very fortunate, in so far as it has not been necessary to shut-down the plant for more than two or three days at a time; and on these occasions the scrubber has been kept working, with the result that a certain amount of benzole extraction has still been effected. The maximum test of 536 B.Th.U. was obtained under these conditions. So far as the scrubber itself is concerned, the reduction in the degree of benzole extraction has had a noticeable tendency towards eliminating the necessity for a compulsory lay-off, due first to the slower speed of the driving engine, and secondly to the freedom of deposits of anthracene, &c., in the rotating bundles. These growths were a serious difficulty with rigorous stripping, causing excessive back-pressure, and necessitated the complete dismantling of the bundles at frequent intervals. The second disadvantage of this method lies in the fact that with a supply of fresh oil there is a tendency for the calorific value to drop rather low unless carefully watched. This difficulty can be met in many obvious ways—namely, by mixing the fresh oil with the old, by slowing down the engine or the pumps, or by by-passing a small portion of the gas.

In our case the average extraction per ton of coal effected in the benzole washer in order to reduce to a figure slightly above the declared value works out at just over two gallons. It is in this respect that this method of calorific value regulation opens up a question of considerable importance—namely, does benzole extraction pay? A good deal of divergent opinion exists on this point, and in many works benzole washing has been discontinued on the grounds that the benzole is more remunerative if allowed to go forward in the gas. There is possibly some truth in this point in so far as a gallon of benzole may not realize the same amount as its equivalent in gaseous therms, reckoned on the selling price of the latter, and deducting manufacturing costs of the former. The comparison should be made, however, not with the selling price per therm, but with the cost price into the holder. Where the comparison on these lines shows a profit on the side of benzole extraction, there is no justification for allowing idle benzole plants to remain so, as any profit derived from this source is additional to the normal profit of the undertaking. A similar but more striking conclusion is arrived at by looking at the question from a different point of view. Taking normal figures relating to costs and carbonizing results, and working out the net cost per therm with and without benzole washing, based on a definite therm output, (say) 10,000 therms, the comparison shown on the next page is obtained.

In each case the full 10,000 gaseous therms are available for distribution; hence the income from gas sales is the same. It will be noticed that the additional profit from the benzole extraction has the effect of reducing the net cost per therm very considerably. Costs not shown above are common to both, and do not affect the ultimate comparison. A good deal depends upon the price ruling for coals, residuals, and labour; but under normal conditions the second scheme will always produce the cheaper therm.

The subject of works practice could be continued indefinitely, but I trust that the foregoing points, which have been selected as showing some points of dissimilarity from usual procedure, may be sufficient to initiate a discussion. One further point regarding our purification methods may perhaps be included. We find that in spite of preceding plant of theoretically sufficient capacity, a certain amount of tar fog occasionally travels forward with the gas to the purifiers. The result of this, with our system of downward flow, is to form an impervious scum on the top of the oxide, causing back pressure and permanently fouling the oxide both in its work and appearance. A simple and effective method of avoiding

Without Benzole Washing.

	£ s. d.	£ s. d.
Coals, $\frac{10,000}{66\frac{1}{2}}$ = 150·4 tons at 23s. 9d.		178 12 0
Carbonizing wages, 10,000 at 0·4d. per therm . .		16 13 4
Repairs and renewals, 10,000 at 0·4d. per therm .		16 13 4
		211 16 8
Less Residuals.		
Coke, 79 tons (10½ cwt. per ton) at 28s. 6d. net .	112 11 6	
Tar, 1354 gallons (9 gallons per ton) at 4½d. net .	25 7 9	
Sulphate, 1·34 tons (20 lbs. per ton) at £5 net. .	6 14 0	144 13 3
Net cost per 10,000 therms . . . = 1·61d. per therm.		67 5 5

With Benzole Washing.

	£ s. d.	£ s. d.
Coals, $\frac{10,000}{64}$ = 156·25 tons at 23s. 9d.		185 10 11
Carbonizing wages, 10,000 at 0·4d. per therm . .		16 13 4
Repairs and renewals, 10,000 at 0·4d. per therm .		16 13 4
		218 17 7
Less Residuals.		
Coke, 82 tons (10½ cwt. per ton) at 28s. 6d. net .	116 17 0	
Tar, 1406 gallons (9 gallons per ton) at 4½d. net .	26 7 3	
Sulphate, 1·4 tons (20 lbs. per ton) at £5 net. . .	7 0 0	
Benzole, 312 gallons (2 gallons per ton) at 7½d. .	9 15 0	159 19 3
Net cost per 10,000 therms . . . = 1·41d. per therm.		58 18 4

this trouble has been adopted, and consists in spreading about 3 in. of fresh straw on the top of each box. This retards the greater part of the tar fog very efficiently, while still leaving an open path for the gas. By changing the straw every three or four months the oxide is kept practically free from tar, resulting in a higher sulphur content, while the interval between having to remove covers to ease back pressure has been more than doubled.

In conclusion, I desire to express my thanks to the Directors of the Company, and also to my chief, Mr. A. B. Walker, both for permission to publish the foregoing points, and also for their readiness to allow the meeting to be held at these works.

Discussion.

The CHAIRMAN congratulated Mr. Anderson on his paper.

Dr. WEYMAN said the thanks of the members were due to Mr. Anderson for his useful paper, which broadly reviewed the whole of the subject of gas manufacture, and brought out a good many things of a more or less common-sense character. With regard to benzole washing for the equalization of the calorific value of the gas, this would mean that a certain number of therms would be delivered to the consumer without any payment being made, and the benzole plant would gain so many therms for nothing.

Mr. ROBERTSHAW remarked that in his reference to coke consumption, Mr. Anderson stated that recent tests with pan ash gave 35 p.ct. of ashes, and 1·5 p.ct. of breeze. Mr. Robertshaw thought that, if Mr. Anderson had a pan-ash separator, he might recover a good deal of breeze. The speaker recovered 40 p.ct. of coke and breeze from pan ash.

Mr. F. COOK (Sunderland) said the paper showed them how science was applied. Mr. Anderson had spoken of the deposits in the scrubbers, and the speaker would like to know what oil he used for benzole recovery. Had Mr. Anderson tried gas oil?

Mr. A. H. BAGSHAW, Secretary of the Auxiliary Section, remarked that the amount of coke given in the analysis of pan ash, at 13·2 p.ct., seemed very low. He thought Mr. Anderson would find, if he had water gas plant, that a pan-ash separator would be very useful. As regards the purifiers, it was interesting to hear from Mr. Anderson that he put straw on top of the oxide. At the speaker's works they had difficulty with back pressure in the winter, and straw seemed to be the solution of this trouble.

Mr. ANDERSON, replying to the discussion, said that they knew Dr. Weyman was an authority on benzole extraction, and he agreed with him that benzole would credit them with a certain number of therms. They had silica retorts working at Howdon, but not sufficiently long enough to say much about them. With regard to the percentage of breeze in the pan ash, he was surprised when he found only 1·5 p.ct. The coke put into the producer did not go over any of the coke-handling plant, and practically no breeze was formed. This partly explained the point. The figure of 40 p.ct. of breeze and coke in the pan ash at Sunderland seemed to be rather high. He would like to know what effect it had on coke consumption. As to deposits in the scrubbers, it was a long time since they had experienced this difficulty. The oil used was ordinary creosote oil. Referring to the purifiers, he said that the placing of straw on top of the boxes was an uncommon practice. There was nothing scientific about it. It was merely a plain, common-sense method which had been efficacious in their case.

Mr. J. B. HENDERSON, of the Walker and Wallsend Gas Company, then read a paper on "A Few Distribution Experiences." This and the discussion which followed will be given in next week's "JOURNAL."

Institution of Civil Engineers.—A meeting of the Institution will be held on Tuesday, Nov. 18, at 6 p.m., when Mr. W. J. Hadfield, M.Inst.C.E., will read a paper entitled "Notes on Modern Practice in Road-Making." A students' meeting will be held on Wednesday, Nov. 19, at 6 p.m. At this Mr. P. W. Thomas, B.Sc., will give an address.

AMERICAN GAS ASSOCIATION.

Review of Reports and Papers.

[THIRD ARTICLE.]

Gas Company Statistics.

This year's Committee on Gas Company Statistics are the first to be appointed by the Association to make a study of the very broad subject of statistics and their analysis as applied to gas undertakings, and how best the information which can, and should, be included may be most advantageously gathered and interpreted so as to be of the maximum benefit both to the individual company and the industry as a whole. The Committee consider the question to be of sufficient importance to recommend that consideration be given to the development of a statistical department at Association headquarters which will not only handle the annual statistics hitherto published, but will be available throughout the year for special statistical investigations on matters of importance to the industry. The report includes accounts of work done by three Sub-Committees. One of these brings out the underlying principles with which it is necessary for the analyst to be acquainted; another deals with the value of statistics as applied to sales, revenues, and costs; while the third covers a discussion of the statistical report forms now in use by some of the companies, and includes a set of proposed monthly report forms based on a study of those considered. The conclusion, they say, should not be drawn that the work of the statistician is simply that of compiling and tabulating statistics. His important duty is the analytical work involved in the interpretation of statistics, and in relating them to the problem in hand.

Distribution.

Under the Chairmanship of Mr. J. D. von Maur, of Toronto, the Distribution Committee for 1924 was formed of 49 representative members, each of whom was connected with one of the large centres of the gas industry. A list of 38 questions was submitted for study by each member acting through the company with which he was connected. After the replies to all the questions had been received, they were summarized; and these summaries are set out in the report. As showing how desirable is discussion on the various subjects selected, the Committee say: "There probably have been more than 30 million joints made on main pipes in the United States during the past three-quarters of a century; and yet in cities such as Chicago, Milwaukee, Detroit, Montreal, St. Louis, Toronto, Syracuse, and Newark, all of whom are laying 20-in. medium high pressure cast iron gas mains, no two are using the same kind of joint. The statement has been made that the design of the present cast iron bell is probably faulty. We do not even have a standard specification for the packing which is to go into the joint. The Chairman believes that even the principle of trying to make a joint tight at the face of the bell, instead of at the back of the bell, is erroneous."

The "Pabco" portable pipe covering machine, reports Mr. R. S. Fuller, Engineer of Gas Distribution to the Pacific Gas and Electric Company, has, after two years of service, proved to possess portability combined with extremely efficient operating characteristics. It comprises a "head" which contains power driven feed rolls set at an angle to the axis of the pipe. By means of these rolls, the pipe is revolved and advanced longitudinally. Below the head is a tank containing molten bituminous cement. A roll of covering is mounted in a frame, and the covering is carried through the tank of cement, and thence to the pipe, where the spiral advance of the pipe effects a suitable winding of it. A width of covering strip roughly proportioned on the basis of 9 in. covering for 6 in. pipe is used. Length after length of pipe is fed through the machine without interruption—internal slip plugs coupling the lengths. The covering is broken at the end of each length. A small gasoline engine supplies the necessary power. The base material of "Pabco" machine pipe covering is a special felt which possesses a high degree of flexibility and strength. This is saturated with a bituminous compound and coated on both sides with moisture resistant materials. The resultant product is strong, flexible, and extremely impervious to water and moisture.

Replying to a question as to whether additional distribution troubles have been encountered since gas having a lower B.Th.U. standard has been distributed, one member reports: In the past six or eight years, the heating standard for gas distributed in our city has been reduced from about 600 to 550 B.Th.U. No particular difficulty has been experienced; but there is an apparent increase in the deposit of dust found in district governors and in high pressure transmission mains. This has just recently appeared, and is evidently on the increase. We suspect that it has something to do with the quality of the gas that is now being distributed, which is very dry, and free from hydrocarbon condensation. The dust analysis is approximately: Iron, 27 p.ct.; volatile matter, 63 p.ct.; prussian blue, 8 p.ct.; and silicon, 2 p.ct. We are now using liquid purification, and expect to have relief from the danger of our mains being destroyed from the inside. For the present, we are removing the dust by the use of screens at the inlet of the district governors.

A device for making cement joints is included among a number of "wrinkles." The cement is placed in the joint, and then rings or clamps are placed around the joint and the bolts tightened, thus forcing the cement into the joints under pressure.

MANCHESTER AND SMOKE ABATEMENT.

AN EXHIBITION AND A CONFERENCE.

ON the morning of Tuesday of last week, after some very early sunshine, late risers at Manchester found themselves in the midst of a thick fog, which formed an appropriate text in connection with important events which had been arranged to take place that day—though happily the sun later on again made its appearance. Probably in any event the extraordinary weather conditions would have led to a fog in Manchester on the day in question, but it would have been a different fog had the air been freer from impurity. The events referred to were the opening of a Smoke Abatement Exhibition in the City Hall, Deansgate, Manchester, and the first session of a Conference on Smoke Abatement, under the auspices of the Smoke Abatement League of Great Britain, which extended over three days. This was held in the Town Hall, Albert Square. The organizers both of the exhibition and of the conference can justly claim to have put forth a big effort in the direction in which much work is urgently needed.

THE EXHIBITION.

The exhibition in the City Hall, which is a very good one, and is directed entirely to the question of smoke abatement, will remain open until the end of this week (Nov. 15). It was organized by Provincial Exhibitions, Ltd., and the hall is comfortably filled with a representative display of gas making and utilizing equipment, bye-products, electrical apparatus, and smokeless fuel, &c., all of which can be inspected as one enjoys the music of the Manchester Radio Band. A number of interesting lectures will be delivered during the run of the exhibition. Miss H. H. Tuxford, M.C.A., shows the economy and ease with which cooking and baking can be done by gas; while among the lectures, Mr. Hamilton Davies will next Friday afternoon and evening (Nov. 14) deal respectively with "Gas in the Home" and "Domestic Heating by Gas."

At noon on Tuesday, the 4th inst., in the presence of a large assembly—including Mr. Samuel Tagg, of Preston (late President of the Institution of Gas Engineers), Mr. W. M. Mason (the Manager of the British Commercial Gas Association), and a number of other gentlemen connected with the gas industry—the opening ceremony was performed by the Rt. Hon. the Lord Mayor of Manchester (Alderman W. T. Jackson, J.P.); the chair being taken by Alderman Fred. J. West (the Lord Mayor-Elect).

MUCH DONE, BUT MORE TO BE DONE.

Alderman FRED. J. WEST said he could not conceive a more suitable day for illustrating the usefulness of an exhibition of this character, and of demonstrating the need for a Smoke Abatement League; for Manchester that morning had been visited by a fog which no doubt had been rendered worse by the smoke pall that hung over the city. It was his privilege to offer a very cordial welcome to the Lord Mayor of Manchester, who had come to open the exhibition, and he could congratulate the organizers on their selection in this matter. Apart from the very high position which Alderman Jackson held, he had during his municipal career devoted a very great deal of attention to the health of the city, and had successfully tackled many difficult problems. He trusted that he might be spared for many years to continue this good work. The organizers of the exhibition had also been successful in securing what might be termed a brilliant list of exponents of the different ways and means of solving the smoke problem of the great cities. For such an exhibition there could be no better place than Manchester—which was the centre of the greatest industrial population in the world. They were fortunate in Manchester in possessing public utility services which had already done a great deal, and would in the future do a great deal more, to get rid of the smoke which enveloped the city. Their enterprising Electricity Department were rapidly extending the use of electric power, and so steadily eliminating factory chimneys; while their equally enterprising Gas Department were pushing the use of gas for cooking, power, and industrial purposes, and so reducing the vast numbers of domestic chimneys which did so much in the aggregate to pollute the atmosphere. This exhibition and conference were going to be the beginning of a new era in their efforts to solve the smoke problem. He would now ask the Lord Mayor to declare the exhibition open.

The LORD MAYOR said he would like to congratulate the Smoke Abatement League on the conception of the idea of holding this exhibition, and on the measure of success that had attended their efforts. He knew of no single factor that impaired the amenities of the city more than did black smoke. It created dulness, ugliness, dirt, and unhealthy conditions. A most striking instance of national stupidity was their toleration of this filthy nuisance of black smoke. It was impossible to estimate the loss that accrued from it in Manchester.

AN AIR POLLUTION ADVISORY COMMITTEE.

Some years ago they established an Air Pollution Advisory Committee, and this Committee divided themselves into sections, one investigating the matter from the economic point of view, another from the engineering, a third from the legal, and a fourth from the statistical. He thought that possibly the most valuable work was done by the statistical section, of which Councillor Melland was the Chairman. One very striking instance of the loss resulting from smoke was a comparison of the cost of washing ordinary domestic clothes in Manchester and in Harrogate; the difference between the two places, due entirely to smoke, was as much as £250,000 a year. This was the mere cost of soap, starch, and fuel, leaving out of account the additional labour and the damage done to the clothes by extra washing. If they said it cost Manchester £1,000,000 per annum, it would be putting it on a very conservative basis indeed. Smoke, apart from the material damage it caused, was a very important factor in impairing the health of the community. People were just beginning to realize the value of sunshine as a factor in both preventive and curative medicine. It had a most powerful effect on germ diseases. In Manchester they never had the benefit of the direct rays of the sun; these were always in some measure intercepted by a canopy of black smoke. There were, of course, two main sources of pollution—the factory chimney and the domestic fire. Councillor E. D. Simon, in his book "The Smokeless City," said that 75 p.ct. was due to domestic fires; but, so far as Manchester was concerned, he (the speaker) was inclined to doubt this. He was afraid the factory chimney was a far greater offender than this percentage indicated, though possibly as applied to the whole country 75 p.ct. might be correct as the measure which the domestic chimney contributed. In Manchester it was a matter of common observation that Sunday was by far the brightest day of the week, when the factories were still, and when domestic chimneys were possibly emitting more smoke than on any other day. A large residential town was practically smokeless, though thickly populated. As regards the remedy, he thought that reform must proceed upon two lines. No doubt legislation was necessary; repressive measures were required up to a point. But the most important thing was education—creating a public conscience upon the question. In Manchester he did not believe that repressive measures could do very much more than was being done at the present time; but there was need for more legislation, especially in the direction of securing a higher standard of administration and a greater measure of uniformity.

LACK OF UNIFORMITY.

The whole trouble seemed to be due to a lack of uniformity so far as legislation was concerned. They in Manchester had local powers enabling them to impose a maximum penalty of £10 for each offence; but he believed Salford could only inflict a fine of £5, and under the Local Health Act the maximum penalty was 20s. or 21s. There was also an utter lack of uniformity in administration. Then again, they did not always get uniformity on the magisterial bench. But by far the most important thing was the education of public opinion. They must teach the manufacturer and the householder that the pollution of the atmosphere which every human being had to breathe was a dirty, selfish, and anti-social act, and unworthy of any right-minded and decent citizen. He had great pleasure in formally declaring the exhibition open to the public.

The MAYOR OF SALFORD (Alderman J. P. M'Dougall) in proposing a vote of thanks to the Lord Mayor, remarked that the Gas and Electricity Committees of both Corporations might do a great deal to assist in smoke abatement. The education of public opinion was to his mind the most important thing of all. They had been doing it quietly. At one time it was gas against electricity, or electricity against gas; but they had got past this now. They had more sense, and so were pushing both. Each had a great future. They knew now that the dirt in the atmosphere was caused by the wasteful use of coal, and what could be done to prevent this would only be done by systematic education of both young and old—by having lectures and exhibitions like the one they were opening there. At present there was far too much smoke from railway engines and road locomotives.

Dr. R. VEITCH CLARK (Medical Officer of Health for Manchester) seconded the motion, and pointed out that Alderman Jackson was Chairman of the Public Health Committee, as well as Lord Mayor. What he had said that morning was not only the official expression of the city's view, but was also his own personal conviction. In addition to being a health question, the smoke nuisance was a very great economic one; by the abatement of smoke, they would be helping greatly to conserve the nation's resources.

Mr. J. W. GRAHAM, M.A. (the Chairman of the Smoke Abatement League of Great Britain), moved a vote of thanks to the Chairman. Remarking that Alderman West was the Lord Mayor-Elect of Manchester, he said it was indeed a happy augury for the cause of smoke abatement that they should have side by side on that platform the present Lord Mayor and the coming Lord Mayor of Manchester, the Mayor of Salford, and the Medical Officer of Health for Manchester.

Councillor W. MELLAND, J.P. (the Hon. Treasurer of the Smoke Abatement League), in seconding, declared that the League had taken up a task of real national utility; and they could not do very much unless they had national support. He was glad to say that they had between twenty and thirty towns up and down the country affiliated with the League. This was a splendid start, but it was not anything like enough. There was terrible apathy on the subject, which must be removed.

LANCASHIRE AND CHESHIRE GAS EXHIBIT.

In noting some of the exhibits which appeal more particularly to "JOURNAL" readers, mention must first be made to the Lancashire and Cheshire Gas Exhibit, which is under the control of a Committee representing the gas undertakings of the two counties named. It extends across the near end of the hall, while at the far end are the Manchester Corporation Electricity Department and the British Electrical Development Association.

The gas display is a complete exhibition in itself of what is latest and best in appliances for heating, lighting, cooking, &c., by gas. Both the Committee responsible for the arrangement, and the many well-known firms who have co-operated with them are to be congratulated upon the success of an effort which cannot fail to be of material benefit to all who have taken part. It is, of course, impossible here to enumerate all the different appliances, and the name of the maker of each; but the following list of the firms who have co-operated affords ample proof of the remark just made that everything shown is of the latest and best.

ARDEN HILL & CO., LTD., Salford Street, Aston, Birmingham.
GEORGE BRAY & CO., LTD., Leeds.
CANNON IRON FOUNDRIES, LTD., Deepfields, Bilston, Staffs.
CLARK'S SYPHON STOVE COMPANY, Academy Street, Warrington.
DAVIS GAS STOVE COMPANY, LTD., 60, Oxford Street, London, W.
W. H. DEAN AND SON, LTD., Victoria Works, Accrington Road, Burnley.
EVERED & CO., LTD., Surrey Works, Lewisham Road, Smethwick, Birmingham.
FALK, STADELMANN, & CO., LTD, 83-87, Farringdon Road, London, E.C.
FLETCHER, RUSSELL, & CO., LTD., Palatine Works, Warrington.
GENERAL GAS APPLIANCES, LTD., Guide Bridge, near Manchester.
JACKSONS' BOILERS, LTD., 83, Kirkstall Road, Leeds.
JAMES KEITH AND BLACKMAN COMPANY, LTD., 27, Farringdon Avenue, London, E.C.
MABBOTT & CO., LTD., Phœnix Iron-Works, Poland Street, Manchester.
R. & A. MAIN, LTD., Gothic Iron Works, Falkirk.
MODEL ENGINEERING COMPANY, LTD., 8-10, Addison Avenue, Holland Road, London, W.
NICO LIGHT COMPANY, LTD., 19-21, Farringdon Avenue, London, E.C.
PARKINSON STOVE COMPANY, LTD., Stechford, Birmingham.
RICHMOND GAS STOVE AND METER COMPANY, LTD., 164-172, Queen Victoria Street, London, E.C.
WILLIAM SUGG & CO., LTD., Ranelagh Works, Chapter Street, Westminster, S.W.
WALKER AUTOMATIC GAS SIGNS, 22, Charterhouse Square, London, E.C.
WHOLESALE FITTINGS COMPANY, 78, High Street, Manchester.
WILSONS AND MATHIESONS, LTD., Carlton Iron Works, Armley, Leeds.
JOHN WRIGHT & CO., LTD., Essex Works, Aston, Birmingham.

The exhibit is divided into some fourteen sections, each distinctive in character, and attractively fitted up. Taking first the three model rooms, there is a dining room tastefully furnished, and provided with a beautiful modern fire in handsome surround. Charming lamps for the most effective lighting are also displayed in this room. Next is the all-gas kitchen, which includes a gas-heated circulator with thermostatic control, shown in operation. The latest type of gas cooker and fire, fixed in a minimum of space, is also to be seen here. A supplementary water heater for the supply of hot water to the sink and wash boiler is exhibited; and, in addition, there are a very neat gas iron and a gas incinerator for the disposal of kitchen refuse. In the bathroom, the advantages of gas for water heating are strongly emphasized. A geyser is shown in operation, for providing a hot bath with the minimum of trouble and time at any hour. A small-size heater is fitted for supplying hot water to a lavatory bowl or sink, and for drying towels there is a self-contained gas-heated towel rail.

Beyond the model rooms, there are special sections for apparatus for particular purposes. For instance, a gas fire and radiator section contains a number of artistically-designed gas fires, in operation, for use in dining-room, bedroom, lounge, or kitchen, set in appropriate surrounds. A practical example of economy in floor space and building materials is given. Various types of gas-heated radiators are there, for use in the hall, office, workshop, &c. In the gas cooker section will be found the newest designs of gas cookers, embodying all the latest improvements; and the same with the hot water section, which contains various heaters for use in canteens, cafés, &c., including a 20-gallon builders' set, café fountain boiler, milk and coffee urns, egg boiler, and a comprehensive selection of other modern types of apparatus for water heating. An excellent idea was the connecting of an automatic gas meter to a geyser, so that the visitor is able to see for himself the amount of hot water which can be obtained for 1d. This forms a most effective demonstration.

There is an industrial section, in which are found as complete a set of gas-heated furnaces as has been possible to arrange in the space at disposal; and a special canteen and restaurant section contains large-scale cooking apparatus, suitable for use in hotels, canteens, restaurants, schools, and public institutions, including a large roasting oven, hot closet with carving table and overhead gear, bakers' and confectioners' ovens, boiling tables, sugar boiler, fish-frying range, stock-pot and stand, &c.

Another section—the laundry section—is set aside for gas apparatus for home and industrial laundry work, including a large water heater with automatic gas control, an iron heater for twelve irons, a gas-heated washing machine, clothes dryers and airers, gas irons, and various sizes of wash boilers. Practical demonstrations of ironing are given during each day. Several high-power lamps are fitted in this section. Much attention will be paid to the greenhouse and garage section, which is realistically got up, and shows two methods of heating greenhouses—by gas or coke. Safety radiators, approved by the fire insurance companies, and special garage lamps, are also to be seen there.

Quite a feature of the exhibit is the lighting section, where there is a special display of very neat and artistic gas fittings suitable for various positions, as well as an excellent display of outside lamps in the passages. Attention is drawn to the patent distance control valves which are fitted to the outdoor lamps overhanging this section, and which, it is pointed out, are specially suitable for use in churches, halls, &c., or any indoor installation where the lamps are not easily accessible. The various firms co-operating have included their individual types of burners, pendants, and brackets, which make an interesting display of modern gasfittings. Beaded shades, plain and coloured glass globes, &c., are also shown, and various methods of illumination by gas illustrated in a practical manner. Attention is drawn to the latest pattern of high-pressure gas lamps, of which four have been fixed in the gangways near the gas exhibit; and a further display of gas fires, set in appropriate surrounds, is also made here.

Visitors must also admire a delightful model shop window in which are displayed a choice selection of fabrics dyed from the derivatives of coal tar. Besides thus impressing upon the public some of the advantages of not wasting coal in the open grate, the window affords an opportunity of which full advantage has been taken to display the excellent results obtainable by modern methods of gas lighting.

BRITISH COMMERCIAL GAS ASSOCIATION.

As part of the co-operative effort of the Lancashire and Cheshire Gas Undertakings, the British Commercial Gas Association occupy a commanding position facing the entrance to the hall, and, as usual, they have put up a most effective display. The exhibit is in two parts—the economy side, with all the bye-products and their uses depicted, and the wasteful side which illustrates the effects of the burning of raw coal. The exhibit is really based mainly upon Wembley lines, but a particularly striking touch is given to the present display. On the economy side the eye is at once caught by an appealing reproduction of the "Spirit of Coal," from the now famous Wembley poster, emerging from a coal heap, and from the "Spirit" rises a brilliant rainbow—suggesting performance as well as promise—which links together the two portions of the display. By this rainbow the "B.C.G.A." picture what the gas industry performs and promises in the way of smoke abatement. Here is to be found the key to the whole exhibition.

Special attention is claimed by the sulphate of ammonia section, which is one of the finest displays of the kind we remember to have seen. This is doubtless on account of the fact that the season of the year lends itself to the furnishing of the choicest fruits as well as root crops. The pears and apples remind one of a provincial fruit and flower show, while the vegetables also are of champion class. On the waste side a telling feature is made of enlarged photographs depicting many of the evils arising from the uneconomic use of coal. Points are particularly emphasized proving the lamentable damage done to health, as well as to material things, by the misuse of coal consumed in a raw state.

GIBBONS (DUDLEY), LTD., AND GIBBONS BROS., LTD.

On this stand, Messrs. Gibbons Bros., Ltd., of Dibdale Works, Dudley, make a feature of their new patent regenerative gas furnace—the outcome of a great deal of experimental work which the firm have carried out with a view to obtaining an improved design which would give increased thermal efficiency. It is really an adaptation of their well-known coke producer-fired furnaces. Bunsen burners and injectors are entirely eliminated, gas and air being admitted to the combustion chamber by means of suitably designed fireclay ports. The regenerator, which is of special design, is utilized to pre-heat air and gas, and is of ample proportions. The construction is very strong and light, allowing of a rapid transfer of heat from the waste gas to air, and waste gas to live gas. By-passing is impossible, owing to a new patented feature embodied in the design. The tiles forming the flues are only ½ in. thick, making a total of 1 in. metal separating air and waste gas, and a similar thickness between live and waste gas. The regenerator is constructed in an arched chamber, so that it carries no undue weight, and is not subject to jarring or vibration when the furnace is being loaded. Particular attention has been paid to the question of insulation, and experiments in this direction have been carried out with a view to obtaining the best possible material for the purpose.

The smallest furnace the firm can make on this system is 3 ft. long by 2 ft. wide by 1 ft. high internal dimensions. The largest furnace on order is 13 ft. by 4 ft. 6 in. by 1 ft. 6 in., this being a closed muffle to work at a temperature of 1150° C. These furnaces—which, owing to the quantity of brickwork involved in their construction, are more suitable for continuous operations—burn gas supplied at the ordinary town pressure, and air is induced by natural chimney pull. Temperatures up to 1400° C. can be maintained in open furnace or closed muffle, so that the furnace is suitable for treatment of high-speed and alloy steels, burning of porcelain and pottery ware, and other work requiring extremely high temperatures.

A patent machine for charging and discharging the furnace in a minimum amount of time is also on view. The Gibbons-Van Marle charger and discharger was first put to work in Birmingham

about three years ago, and apart from some early minor alterations has worked continuously and with a minimum of attention ever since. In addition to the enormous saving of time and increased comfort of the men, it is found that there is less wear and tear on the sides and floor of the furnace chamber, owing to the even loading and distribution of the material. The machines can be had hand operated or power driven.

In addition, Messrs. Gibbons draw attention to their well-known refractory materials, including segmental gas retorts of 95 p.ct. silica, silicious retorts of 84 p.ct. silica, and fireclay retorts, together with a range of regenerator tubes, tiles, and various shaped bricks.

West's Gas Improvement Company, Ltd.

The principal exhibit of West's Gas Improvement Company, Ltd., of Manchester, is a coke chamber complete with coke discharging door and Glover-West coke extractor, with driving gear in motion. There is also a complete section of a vertical retort, with samples of other refractory goods made at Friden.

Interesting photographs and drawings are exhibited, and effective use is made of two photographs, shown side by side, of the old gas-works at Carlisle, in its full panoply of smoke and steam, and the new Rome Street Works, where, in Glover-West vertical retorts, gas is made without any of the evil accompaniments generally associated with a gas-works.

Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.

This stand is on an island site, and there have been erected in the centre two fireplaces built-up of the refractory materials—including silica, firebrick, and insulating bricks—used in the construction of the Woodall-Duckham specialities. Domestic coke made in Woodall-Duckham vertical retorts is being burnt in one of the fireplaces, in which there is a semi-well grate. A highly incandescent fire is to be seen, which is only possible when dry sized coke is available for use. In the other fireplace has been fitted one of the Main's "Cinderella" fires, burning town gas. These two domestic fires illustrate the chief contribution of the gas industry to the solution of the smoke nuisance.

An excellent model of a typical installation of Woodall-Duckham continuous vertical retorts is on view on the stand, and a cross-section of the retort is shown on large diagrams prominently displayed.

The Woodall-Duckham Companies are also the builders of the latest type of coke oven—the Becker oven—which has been developed in the United States; and a model of the Becker oven is on view. The Companies are builders, too, of Munich chamber ovens, in which bulk carbonization on intermittent lines is carried out; and there is an excellent model of the intermittent vertical chamber oven system. Each of these carbonizing systems has its own particular application; and the Woodall-Duckham Companies are in a position to apply the most suitable system to the particular requirements of the gas engineer.

There is a scale model of a 50-ton per day "T.I.C." tar distillation plant, in which tar is distilled in contact with molten lead. The advantages are that there are no fire risks, and tars of all types can be distilled with efficiency, and without over-cracking. One of the most interesting models is the Carpenter centrifuge, for drying coals. It is a model of an apparatus in which coal can be dried at the rate of 100 tons per hour down to 5 p.ct. and less. Arranged round the stand is a selection of photographs of plants which the Companies have installed in recent years in different parts of the world.

The Woodall-Duckham Companies have for the last three or four years concentrated, in the research section, on a study of the possibilities of blending coals in order to make available the whole of the gas-making coals in this country for gas-works use, whether coking or non-coking. Remarkable polished cross-sections of coke samples made in various ways are shown, and it is believed these are the first samples that have been prepared in this way in this country. The process of briquetting and blending, illustrating the new system which the Companies are introducing to British gas engineers, may be followed.

The stand, as a whole, clearly demonstrates the progressive policy permeating the gas industry, and indicates that the industry is prepared to undertake the whole production of domestic fuels, solid and gaseous, as its own responsibility.

Howden-Ljungstrom Preheaters (Land), Ltd.

A patent air preheater to which reference was made during the conference meetings is marketed by Howden-Ljungstrom Preheaters (Land), Ltd., of 133, Helen Street, Govan, Glasgow. It is an effective and simple device for utilizing the heat in the waste gases from furnaces of all kinds. Metal plate surfaces are carried alternately into the currents of waste gases and of cold air in such a way that in one part of the apparatus the gases give up their heat to the plates, and in another part the same plates give up to the air the heat absorbed from the gases. Thus heat is actually transferred mechanically from the gases to the air, and is not conducted through the walls of tubes or of metal partitions. In the simplest way, the process is made continuous by assembling the plates in a part which rotates at a low speed.

The rotating member or rotor is carried in a cylindrical steel casing made in three horizontal sections, and is supported by three rollers. Above the rotor the cylinder is divided internally by a radial partition wall into a gas outlet chamber and an air inlet chamber, and below the rotor a partition wall forms the gas inlet chamber and the air outlet chamber. Under the action of an induced draught fan, the gases traverse those elements situated at any given moment between the gas inlet and outlet chambers, and give up their heat to the metal surfaces; and simultaneously the air sucked through the forced draught fan traverses the elements then passing through the space between the air inlet and outlet chambers, and becomes heated, as the same surfaces are alternately swept by the gases and the air.

The gases and the air pass through the elements in opposite directions, a counter-current effect thus being obtained. This feature, together with the possibility of putting a large amount of heating surface in a small space, accounts for the close approach of the extreme temperatures of the gas and the air to each other, and, therefore, for the high efficiency given by this form of preheater.

Meldrums, Ltd.

An excellent display of smoke prevention boiler appliances, &c., is made by Messrs. Meldrums, Ltd., of Timperley, near Manchester. In the first place, there is a "Koker" type stoker fitted to a model boiler front. This machine fired furnace is said to work with an entire freedom from smoke, grit, or noise, and nothing but a slight haze is visible from a chimney serving ten or a dozen boilers fitted with it. This stoker is being fitted to five Lancashire boilers for the London County Council. There are illustrations of the Meldrum "Sprinkler" stoker, usually recommended for work with a fixed grate, and a feature of which is its low upkeep cost. Both types of stokers are suitable for natural, induced, forced, or balanced draught conditions.

A Meldrum forced draught furnace front mounted on a wooden stand draws attention to the details and working of this apparatus. A section of Meldrum patent interlocking firebars is also shown. These bars cannot be displaced while clinkering. The bars themselves are very narrow, as are the air spaces, thus preventing the loss of small fuel by dropping, and at the same time giving the greatest possible air space. Mention may be made of the valvular deadplate, which is automatically opened by the closing of the furnace door after stoking, and allows a stream of secondary air over the fire-bed just at the point of combustion. In addition there is a model of the firm's split bridge, for the admission of further secondary air at the bridge. Absolute freedom from smoke is guaranteed by these two Meldrum features. The whole of the central heating at the Manchester Gorton Housing Estate is done by Lancashire boilers fitted with these furnaces, and burning nothing but unriddled domestic refuse.

For vertical, Cochran, and locomotive type boilers, Messrs. Meldrum have a patent smoke prevention door that takes the place of the ordinary firedoor. This is claimed to be an absolute smoke cure. A scale model can be examined of a Meldrum destructor furnace working in conjunction with a Lancashire boiler. Where no steam is required, one of their standard steel-cased destructor furnaces can be used. For still more limited quantities, there is a circular type of destructor. There are also represented the firm's oil burner for various types of boilers, and their acid-resisting metal for chemical plant, &c. A tiny model of their silent boiling jet is to be seen in actual operation by live steam in a glass jar to illustrate the absence of the effects produced by the use of an open steam pipe for heating and boiling purposes.

Spencer-Bonecourt, Ltd.

Under working conditions on town gas, at the stand of Messrs. Spencer-Bonecourt, Ltd., of Parliament Mansions, Victoria Street, London, S.W., is to be seen a Kirke patent gas-fired boiler, showing a thermal efficiency of between 85 and 90 p.ct., automatically regulated in every way, so that it can be left entirely unattended. These boilers are made in sizes from 15 lbs. evaporation up to 30,000 lbs., and they are adaptable to town gas, producer gas, or blast furnace gas.

There is also shown the Spencer-Bonecourt (Kirke patent) high efficiency gas-fired water heater. This apparatus has an efficiency of 85 p.ct., and can be had in either horizontal or vertical form. With thermostatic control, these boilers can be rendered entirely self-acting. They are intended to replace, for various duties, the ordinary cast-iron sectional boiler.

Kirke patent waste-heat steam boilers have been installed in some of the largest gas works and iron and steel works in the kingdom.

Tangential Dryers, Ltd.

Mr. C. C. Slack, of 9a, St. Peter's Square, Manchester, calls attention to the Tompkins patent tangential dryer, which is made of two types—one for insertion in boilers, and the other (a pressure type) for insertion in pipelines—for the purpose of extracting moisture and foreign matter from steam, air, and gas. The construction is extremely simple, and there are no moving parts. Many of these dryers are already in use in gas-works, chemical plants, and other places.

Thermal Syndicate, Ltd.

Many visitors watch with interest the graphic demonstration made by the Thermal Syndicate, Ltd., Vitreosil Works, Wallsend-on-Tyne, of the resistant nature of their speciality. This is accomplished by allowing a stream of water to play on a heated globe—with, of course, no ill-effects whatever to the latter.

There is a complete range of "Vitreosil" globes and mantle protectors for incandescent gas lighting, in various colours and designs to fit all domestic burners in common use. The use of "Vitreosil" bowls for semi-indirect lighting is illustrated by numerous types of artistic fittings.

WOLLASTON GAS PRODUCERS (MANCHESTER), LTD.

A model is exhibited of the Wollaston pre-coking device for manufacturing cheap producer gas, marketed by Wollaston Gas Producers (Manchester), Ltd., of 26, Corporation Street, Manchester. It is intended to permit the use of a large range of fuels ordinarily considered impossible in gas producer practice. The poor fuel is fed continuously by finely controllable gear at the top of a "retort" (above the producer) which acts as the only outlet for the straight producer gas. Gas enters the retort at about 500° C., and leaves at about 250° C. The fuel becomes coked as it is spread out and worked down from shelf to shelf during a period of approximately 1½ hours, the producer gas picking up during its passage the volatile distillates. The degree and rapidity of coking attained are said to have surprised those experts who have inspected the operation, and are attributable to the subjection of the fuel to the direct influence of the hot exit gas while it is spread out in thin layers and maintained continuously in slow motion.

GAS ENGINES.

Messrs. Crossley Bros., Ltd., of Openshaw, Manchester, show some oil engines and two town gas engines for electric lighting sets. One of the latter, of 5 B.H.P., is working.

The National Gas Engine Company, Ltd., of Ashton-under-Lyne, who also refer visitors to their gas engines and suction-gas plants, show a 30 B.H.P. horizontal cold-starting heavy oil engine, designed for running on crude, residual, refined, or tar oils. It can be on full load within a minute of starting.

LOW-TEMPERATURE PROCESSES, FUELS, &C.

A working model of the "Fusion" low-temperature retort is shown by the Fusion Corporation, Ltd., of Cledford Bridge, Middlewich, Cheshire. In this coal, shale, peat, &c., may be treated for recovery of crude oil. The residue is used for briquettes or powdered fuel purposes, sometimes after taking a screened portion for suction producer gas plants.

The Illingworth Carbonization Company, Ltd., of Pontypridd, demonstrate daily the use of their smokeless fuel.

Pure coal briquettes, smokeless fuels, and light and heavy oils are shown by Leigh Smokeless Fuels, Ltd., of Leigh, Lancs., who have been formed to acquire the sole rights in Lancashire and Cheshire for operating under the patented processes of Messrs. Sutcliffe, Speakman, & Co., for smokeless fuel. The Company are erecting a plant at Leigh to work under this system, which is distinct from what is usually known as low-temperature carbonization, inasmuch as the process is not confined to low temperature, and for some purposes high temperatures are employed. The retorts in course of construction will each have a throughput of 50 tons a day; but designs are prepared for treating some classes of coal at the rate of 250 tons a day per retort. The methods are such as to yield from a given coal the same quantity and quality of tars and oils as low-temperature processes, but with larger yields of motor spirit and ammonium sulphate. The resulting fuel, it is said, possesses free-burning properties, not due to residual volatile matter, but to the fine pore structure formed during carbonization.

Then there is Low Temperature Carbonization, Ltd., of 14, Cockspur Street, London, S.W., whose exhibit is intended to demonstrate the advantages claimed for the low-temperature carbonization of coal. There is a "stick" of Coalite displayed in a glass case; the Coalite being in the shape in which it leaves the retorts, before it is broken up into suitable sizes for domestic use. What Coalite is able to do in the way of heating is demonstrated in a practical manner in various types of stoves.

"Radiant (M.C.P.) Fuel" is recommended by Midland Coal Products, Ltd., of Colwick Estates, Netherfield, near Nottingham. This Company was formed some five years ago with the object of carrying out researches on low-grade non-coking slack, in order to recover the highest possible yields of products on an economical working basis. As a result, a commercial plant capable of carbonizing 100 tons of fuel a day was erected, and has been in operation for over a year. The exhibit shows by stages the products derived from this method of carbonization. As to "M.C.P." fuel, the Company say that, "when burned on the open grate, the appearance of the fire closely resembles that of a gas fire, the heat being produced by the more effective radiant heat, 'instead of' by deceptive flame."

The "L. and N." process of distillation of coal in internally-heated rotary retorts (which formed the subject of a paper on "Some New Aspects of Low-Temperature Distillation," submitted by Mr. Harald Nielsen at the conference), and the "L. and N." assay plant, enable Sensible Heat Distillation, Ltd., of 100, Victoria Street, London, S.W., to make an interesting display. The assay plant is to be seen, together with samples of fuels, oils, &c., derived from the working of the process. There are also photographs of a demonstration distilling and briquetting installation. The rotary retorts can be made in single units up to 200 tons a day, and plants are in course of erection in the United Kingdom and on the Continent.

MEASURING AND RECORDING.

The principal feature of the stand of the Lea Recorder Company, Ltd., of 28, Deansgate, Manchester, is apparatus for the measurement of coal and water in connection with steam plant.

Hay's draught gauges, portable gas analyzer, and combined CO_2 and draught recorder, are shown by Messrs. Duguids, Ltd., of Lymm, Cheshire, in the model boiler house. All these are exceedingly useful instruments when installed in a boiler house.

The "W.R." Patents, Ltd., of Greek Street, Leeds, display the well-known "W.R." combustion indicator, which registers continuously the percentage of CO_2 on a water column. The readings are large, and can be seen at a considerable distance by the fireman, who is thereby enabled to note at once and rectify any falling-away from the maximum CO_2 obtainable. If a record on a chart is required, a recorder can be added to the indicator.

Messrs. A. Gallenkamp & Co., of London, also co-operate with instruments in the model boiler house.

MECHANICAL STOKERS, &C.

The Crosthwaite Engineering and Furnace Company, Ltd., of York Street, Leeds, draw attention to their mechanical stoker and self-cleaning furnace. They are also the inventors of the Crosthwaite indestructible forced-draught furnace bars. It may be pointed out that the stoker and self-cleaning furnace are driven by entirely separate gear boxes, so that the speed of the stoker may be altered independently of the furnace, and *vice versa*.

The "Falcon" sprinkler stoker and self-cleaning furnace of Messrs. Thomas Cass & Co., Ltd., of Falcon Stoker Works, Tipping Street, Bolton, are specially designed to meet sudden demands for steam, to give additional boiler power while using inferior grades of fuel, and to dispense with black smoke under all conditions.

The Superheat Furnace Company, Ltd., of Adolphus Street, Bradford, show patented firebars which fit transversely in the flues, and form a number of troughs, each trough being an independent fire. All the firebars are interlocked, allowing no fine coal to drop through.

Triumph Stoker, Ltd., of 85, Kirkstall Road, Leeds, have a mechanical stoker, with which a small quantity of coal is sprinkled by the shovel over the fire at intervals of a few seconds; the successive throws being directed to different parts of the grate.

A stoker for Lancashire boilers is exhibited by the Underfeed Stoker Company, Ltd., of Aldwych House, London, W.C. This stoker is of the underfeed type; the coal being fed to the grate from underneath by means of a worm in a retort—the air being discharged horizontally into the fire. This method is said to produce complete and smokeless combustion, with a uniformly high furnace temperature, thus prolonging the life of the boiler. The Company also manufacture various other specialities for boiler installations.

MODEL BOILER HOUSE.

Some of the firms referred to in this article, and a number of others, have co-operated in the setting-up of a model boiler house, showing the main points which require attention in connection with a typical Lancashire boiler installation, for economy, efficiency, and smokelessness. It was designed and organized by Mr. C. Elliott, B.Sc., the indefatigable Hon. Secretary of the Smoke Abatement League, who is also Hon. Secretary to the Exhibition.

PULVERIZED FUEL.

The "Atritor" coal drying, pulverizing, and firing machine (Blyth's patents) has been installed in quite a number of works. It is made by Messrs. Alfred Herbert, Ltd., of Coventry, who point out that it is entirely self-contained, and dries, pulverizes, and ejects the coal direct into the furnace for burning. No auxiliary plant is required beyond an elevator and bunker for the raw coal.

The Chemical Engineering Company (Manchester), Ltd., of 49, Deansgate, who are among the firms co-operating in the model boiler house, market the "KEK" patent centrifugal coal grinding and pulverizing mill, for powdered fuel for firing steam boilers or furnaces.

LANCASHIRE AND CHESHIRE GAS EXHIBIT LUNCHEON.

There was a Lancashire and Cheshire Gas Exhibit luncheon at the Midland Hotel on Thursday (preceding the gas industry's session of the conference), with the LORD MAYOR of Manchester in the chair. He was supported by Alderman Sir William Kay and Alderman Fred J. West; those present including, among others connected with the gas industry, Alderman F. S. Phillips (Salford), Mr. Samuel Tagg (Preston), Mr. W. W. Woodward (Salford), Mr. T. Banbury Ball (Rochdale), Mr. W. M. Carr (Stretford), Mr. F. W. Goodenough, Mr. W. M. Mason, and Mr. Walter Dunn (the Secretary of the Institution of Gas Engineers). The Loyal Toast having been honoured,

The LORD MAYOR said his duty now was to propose a toast which was very congenial to him. It was "The Smoke Abatement Effort in Lancashire and Cheshire." Nothing aroused his indignation and his disgust to a greater extent than did the smoke nuisance. They took precautions to secure a pure water supply and pure food, and yet they had done nothing—or very little—in a collective way to secure a pure atmosphere. Now people were just beginning to appreciate the value of pure air, and the effect that it had on health; and it was gratifying to find the gas industry so closely associating itself with the efforts to suppress this filthy nuisance, which was such an absolutely unnecessary one. To his mind, the cheapest form of smokeless fuel was gas, and therefore it was necessary that they should have the co-operation in this affair of those who were responsible for the production and supply of gas. Here he would like to pay a tribute to Sir William Kay and Alderman Phillips for the efficiency and the magnitude of the concerns of which they were the heads.

SOME MANCHESTER FIGURES.

Taking the Manchester gas undertaking, he found from some figures that had been given to him by Mr. J. H. Sillitoe that no less than half-a-million tons of coal were carbonized yearly, and that there were over

a thousand miles of mains. Both Manchester and Salford were municipally owned concerns, and this was a policy he always advocated for general services of this character. The results obtained in Manchester and Salford justified this advocacy. He did not say that one necessarily had better administration and better service under a municipality than under a company; the one great advantage of municipal control of a utility like gas lay on the financial side. He would take Manchester as an example, and it was but one of many. The capital invested in the concern was £4,657,000, and of this there had been already repaid as much as £2,873,000, so that the outstanding debt at the present time was £1,784,000. This meant that the undertaking had practically £3,000,000 of capital upon which there were no loan charges whatever. This gave it an enormous advantage over a private company who had to pay a dividend on every penny subscribed. Again, the average rate of interest on the outstanding debt at Manchester was £4 18s. 2d. p.ct., while a company's dividend would probably be not less than 6 or 7 p.ct. Taking the interest on the outstanding debt at 5 p.ct., the undertaking would be called upon to pay £89,000 a year in interest. If, on the other hand, as a private company they had had to pay even this 5 p.ct. on the whole of the subscribed capital, it would amount to £232,000 a year. This meant a clear gain to Manchester of £143,000 per annum; and as the debt was diminishing in this way, they could look forward to the time when the whole of the Manchester Gas-Works would be a free and clear asset to the city. Again, Manchester, and, he believed, Salford, deserved credit for having eliminated that vicious practice of levying a tax on the gas consumers in the form of profits for rate relief. This was a very bad policy. The idea should be to provide such a commodity at "rock bottom" prices to the consumer. In fact, the taxation of gas—for, after all, it was a tax—was a most retrogressive policy. With the toast he coupled the name of their revered friend Alderman Phillips, of Salford.

Councillor HAMPSON, seconding, urged that the smoke question was very much what they and the general public were prepared to make it.

Alderman F. S. PHILLIPS, in response, remarked that the practice of burning raw coal was an ancient one; and it was hard to "teach old dogs new tricks." At the same time, all who possessed eyes and understanding must admit the extravagance and stupidity of present methods. The securing of a change, he thought, would not depend so much upon the strength of the arguments brought forward as the efficiency with which they were placed before the public. They had arrived at a time when something must be done. Even electricity was better than a coal fire, but he believed a gas fire was preferable to either. Manchester were to be heartily congratulated upon their Medical Officer of Health, who had shown himself a master of the subject they now had under discussion. Now, how were they going to secure a change? He wished well to the Smoke Abatement League; but he suggested that it was not enough merely to prove conclusively their case. They must convince the cottager and his wife; they must go into the highways and the byways; and they must take the information to the people in such a way that they could not help seeing what was the matter. Why should there not be in every town a man full of his subject, earnest in his advocacy, and determined to push forward his case? Then they might see some amelioration of the conditions under which they were living. He trusted the smoke abatement movement might go on from strength to strength, and that eventually they might enjoy the sunshine which God would give them if only they would take it. They could have it, if only they would have it.

Mr. J. WILLIAMS, J.P. (Deputy Chairman of the Lancashire and Cheshire Joint Industrial Council), said he had spent 34 years of his life in the gas industry, and so was interested in it. For many years he was employed making gas, and he considered that the progress of the gas industry was truly wonderful.

THE GAS INDUSTRY.

The Lord Mayor had given figures so far as Manchester was concerned, and perhaps he might supplement these by some referring to the gas industry of Britain. The capital employed in this industry at the present time was over £150,000,000, and the number of employees of 1400 undertakings was 150,000. If they could take those who were interested from the investment standpoint and those who actually worked in it, and instil into them a real interest in the gas industry, the progress would be more rapid even than it had been in the past. ["Hear, hear."] But what the gas industry needed most of all was peace; and in this connection he wanted to pay a tribute to the National and Regional Councils for the magnificent work they had done. They had discovered a method now whereby they could get to know what was going on in practically every gas undertaking throughout the country. This was a position of which every one of them could justly feel proud. He proposed "The Gas Industry of the Country," and with it associated the name of their dear old friend and colleague in the industry, Sir William Kay.

Alderman Sir WILLIAM KAY, in reply, said how much he had appreciated the kind words of his old friend Mr. Williams. It was a matter of the keenest gratification to him that, by means of these Councils, they had been able to bring into line the whole of the gas industry of the country. Now they were in a position to put all the facts of the case on the table. There could be no doubt that there were absolutely distinct fields for both gas and electricity side by side. The enormous increase in consumption in Manchester was because the Committee were affording the householder every facility for the burning of gas. It was now an uncommon thing to have more than a few hours' fog at a time in Manchester; but only by the co-operation of all concerned, and by full recognition of the fact that they owed a duty to their neighbours and to their fellow men, could they hope to achieve a clear atmosphere—a city fit to live in. What they had to aim at was to make gas a little cheaper than coal; this had always been his object. He did not think he would rest until he saw gas in the neighbourhood of 1s. per 1000 c.ft. Their future Lord Mayor, Alderman Fred West—and he did not forget the late Mr. John West, and his first efforts in connection with vertical retorts—was aiming at the same thing.

On the proposition of Mr. W. W. WOODWARD (Salford), a hearty vote of thanks was passed to the Lord Mayor for his conduct in the chair.

The LORD MAYOR, in acknowledgment, remarked that the co-operation of the gas industry with the Smoke Abatement League was a most gratifying thing.

SMOKE ABATEMENT CONFERENCE.

The conference arranged by the Smoke Abatement League of Great Britain took place in the Lord Mayor's Parlour at the Town Hall, Manchester, and comprised three sessions on each of the three days, Nov. 4, 5, and 6, over which it extended. Each session was presided over by a different chairman, and was devoted to a different aspect of the pressing problem that was under consideration. In all, some two dozen papers were presented and lectures delivered to large and appreciative audiences. In noticing these in this and succeeding issues of the "JOURNAL" no attempt will be made to keep to the strict order of the proceedings. It may be mentioned here that the meetings were governed by a series of rules, the third of which read: "Speakers should confine their remarks strictly to the subject under discussion, speak audibly and distinctly, and be as brief and concise as possible. . . . Criticism should, as far as possible, be constructive, and not destructive."

AN INAUGURAL LUNCHEON.

Prior to the first business session, there was a luncheon to municipal delegates in the Town Hall, by invitation of the Public Health Committee of the Corporation—the LORD MAYOR in the chair; and to this over a hundred guests sat down. After the honouring of the toast "The King—the Duke of Lancaster,"

The LORD MAYOR said that, as Chairman of the Public Health Committee—a position of which he was more proud even than of that of Lord Mayor—he extended to the members of the League a hearty welcome to Manchester. He felt honoured that they had chosen the city for their exhibition and conference. The League had done very valuable work in the way of propaganda and educating public opinion on the question of air pollution, and to the Chairman, Mr. Graham, they owed a great debt of gratitude. One could not emphasize too much the value of the research side of smoke abatement; it was more important now even than legislation. Questions as to the right types of grates to adopt, methods of heating, central hot water systems, and sources of motive power had an added importance owing to the tremendous number of houses that would be erected within the next few years.

Mr. C. ELLIOTT, B.Sc. (the Hon. Secretary of the League), referred to the work done, and said he was hoping to arrange an international exhibition next year. America was willing to come in. The League could not, however, carry out their programme, or anything like it, because of lack of funds. The work they were doing was educative, and they felt that some support beyond the affiliation fee of one or two guineas from a number of municipalities would be very welcome. The subscription was 2s. 6d., which was really ludicrous. A new sort of membership had now been formed, which cost 10s. 6d., in return for which subscribers received literature.

ORDER OF BUSINESS.

On the first day, legislation and air pollution were considered, together with the work of the Departmental Committee on Smoke Abatement and the effect of atmospheric impurities on buildings; on the second day, the conference devoted its attention to low-temperature carbonization and smokeless fuel, the effect of light on health, and smoke abatement from the mechanical engineer's point of view; while the two afternoon sessions of the final day were devoted respectively to the use of gas and the use of electricity in smoke abatement, and the evening session to the cost of a smoky atmosphere. Up to the last afternoon session the attendances were excellent, and the success of the conference must be regarded, to a large extent, as a personal triumph for Mr. C. Elliott, B.Sc., the enthusiastic and self-sacrificing Hon. Secretary of the Smoke Abatement League, who must have worked very hard to secure so excellent a programme and such complete arrangements for the meetings. There would seem to be ahead of him limitless scope for his activities.

There were frequent references during the proceedings to the apathy of the public, and at the close there was an actual demonstration of it. Ex-Bailie W. B. Smith, O.B.E., had taken the trouble to come all the way from Glasgow to give a popular lecture, illustrated by lantern slides, packed full of hard convincing facts, and delivered in a style which rendered it a treat to listen to—and his audience, outside the officers of the League, &c., in the beautiful Town Hall of a city the size of Manchester, was under a score. How many, one wonders, were at the same time, in the same city, gazing at thrilling, yet unenlightening, film pictures? Yet the moment would appear to have been exceedingly propitious for propaganda effort of this character. Tuesday morning, the first day of the conference, began with fog, which cleared off later in the day, only to descend again on Wednesday in more disagreeable form, and to get steadily worse until Thursday morning witnessed what many people declared to be the worst visitation of fog that Manchester had experienced for a quarter-of-a-century. This had, however, cleared off before the time fixed for the lecture. In the face of "apathy" of this kind among many thousands of persons who must have been earlier in the day coughing and distressed, half blinded and half choked, less earnest and unselfish workers than those who have joined themselves to the cause of the League would doubtless despair; but nothing of that kind is feared here. Rather will they be strengthened in their determination to follow the course advocated by Alderman F. S. Phillips, at the Lancashire and Cheshire Gas Exhibit luncheon, of going into the highways and the byways and compelling the people to take notice.

BRADFORD ROAD GAS-WORKS.

During the conference, visits of delegates were arranged to the Bradford Road Gas-Works of the Manchester Corporation, and

to the Barton Electric Power Station of the Corporation. The party who proceeded to the gas-works were received by Mr. William Newbigging (Chief Engineer), Mr. J. R. Hill (Acting Engineer), Mr. A. L. Holton (Station Engineer), and Mr. W. Hawkyard (Superintendent), who acted as guides. Mr. Newbigging expressed regret at the unavoidable absence of Alderman Sir William Kay, J.P. (the Chairman of the Committee). An inspection was made of the horizontal house now in use, and the Woodall-Duckham and Glover-West vertical retort installations, as well as of as much of the other plant as the time at disposal permitted.

In the horizontal house, the visitors saw the Fiddes-Aldridge stoking machine at work, and the Drake transporter system for the removal of the hot coke. The retorts are in five tiers of two, and it was pointed out that they have been in use for eight years without having had anything done to them. It was noticed that all combustion chambers were kept under pressure. The second horizontal house is at present under reconstruction. There are on the works eight sets of Humphreys and Glasgow carburetted water gas plant. With the exception of the waste-heat boilers connected with the vertical settings, the steam for the works is provided by boilers fitted with Underfeed stokers, and with these from 5½ to 6 lbs. of steam is raised per pound of breeze used. The vertical retort installations (nominal 4 million c.ft. each) produce from 9 to 10 million c.ft. a day, and when the two horizontal houses are in operation they will turn out some 8 millions, which is also the combined capacity of the water gas sets. The declared value of the gas is 450 B.Th.U., and the works are sending out 460 B.Th.U. The complete maintenance department was favourably commented upon. This is housed in one building, and the station do their own big work there. The seven bays are divided between fitters, turners and machine men, pipe fitters, smiths, and electricians. Finished articles are passed into the adjoining store, which is a two-storey building.

After some time had been spent in chatting and light refreshments, Mr. Evan Roberts, jun., M.B.E. (Chairman of the Manchester and Salford Sanitary Association), eloquently expressed the thanks of those present to the Gas Committee, Mr. Newbigging, Mr. Hill, Mr. Holton, and Mr. Hawkyard. He said the visit had proved extremely enjoyable, and the guides had been so painstaking that everyone must have learned a great deal. He himself had gained a great deal of information on points which he wished to put before the public. Mr. E. G. Stewart (Gas Light and Coke Company) seconded the vote, which was cordially agreed to.

On behalf of the Committee, himself, and the various other gentlemen named, Mr. Newbigging returned thanks. He pointed out that the rapid increase in gas consumption had already done much to mitigate the smoke nuisance. The Manchester Corporation Gas Committee had done an enormous amount of good work in this direction. It seemed to him, however, that further legislation was needed which would prohibit the use of smoky fuel; coal fires would exist until they were prohibited by law.

BARTON POWER STATION.

Mr. E. W. L. NICOL, at the close of his paper on "Gas Coke," said he understood that, though the Barton Power Station was fitted up for the operation of the "Sandwich" system, instead of using it at the present time, they were burning coal only. He had endeavoured unsuccessfully to get during the visit what he could regard as a satisfactory explanation why this was the case.

USE OF GAS IN SMOKE ABATEMENT.

Mr. SAMUEL TAGG, M.Inst.C.E. (Past President of the Institution of Gas Engineers), presided over this session, the programme for which comprised three papers. Those entitled "The Fuel of the Future," by Mr. F. W. Goodenough (Executive Chairman of the British Commercial Gas Association, and Joint Hon. Secretary of the National Gas Council), and "Gas Coke in Relation to Industrial and Domestic Smoke Prevention and Fuel Economy," by Mr. E. W. L. Nicol, Assoc.Inst.C.E. (Engineer and Fuel Expert to the London Coke Committee), are reproduced on other pages of the "JOURNAL." The first on the programme was "Gas Undertakings as Fuel Providers," which was to have been contributed by Sir Arthur Duckham, K.C.B., M.Inst.C.E. (President of the Institution of Chemical Engineers); but to the great disappointment of those present, the author was not well enough to be with them.

Mr. TAGG, in opening the proceedings, said that those responsible for the excellent gas exhibit now to be seen in the City Hall knew that a remedy for the smoke nuisance existed in the general use of gas and coke. They had already convinced a large number of the people of this country that this efficacious and simple remedy lay at their hands. At present some 20 million tons of coal were used annually in the gas-works, but a great many persons who were seeking other cures for the smoke nuisance had not yet adopted the remedy which the gas industry offered. They had arranged for several eminent members of the industry to explain the advantages of the smokeless products which the gas-works rendered available for the community in the relief of smoke. Unfortunately, Sir Arthur Duckham, who was to have spoken first, had been ordered by his doctor to remain at home; but in his place they were happy in having Sir Arthur's colleague Dr. Smith, who would perhaps tell them something of what would otherwise have been contained in the paper.

CONTRIBUTION OF THE GAS INDUSTRY TO THE ELIMINATION OF THE SMOKE NUISANCE.

Dr. E. W. SMITH explained that Sir Arthur Duckham had under adverse circumstances prepared a paper on "Gas Undertakings as Fuel Providers" for the Conference, but on reading it through was so dissatisfied with it that he tore it up. Dr. Smith proceeded: He has, however, asked me to say something of what he had intended to tell you—though, as a matter of fact, I have no idea what lines his paper was to follow.

In speaking of the contribution of the gas industry to the elimination of the smoke nuisance, there is no need for me to elaborate the advantages of gas to the domestic consumer. This aspect has been very well dealt with by others; and at the exhibition to which Mr. Tagg has referred there is a fine demonstration of the possibilities of gas, particularly for the domestic consumer.

There are, however, two aspects of the gas industry's contribution to the elimination of smoke which are, I am afraid, insufficiently dealt with by gas engineers as a whole, and not properly appreciated by the domestic consumer or the industrialist. A good many years ago now, one of the large cities decided that it would boost the possibilities of gas for industrial uses, and at that time it was selling something like 60 or 70 million c.ft. per annum for these purposes. They organized the thing, handled it well, and in a very few years they were turning out 2500 million c.ft. a year, 25 p.ct. of their total output, for industrial purposes.

We know that the smoke nuisance is not entirely due to the industrialists, but is owing very largely to the domestic consumer. I do not think the gas industry uses its staffs and workpeople sufficiently from a propagandist point of view. I think that, with the exception of a few members of the staffs, the average worker in the gas industry is not sufficiently convinced regarding the use of gas or coke for domestic purposes. It is not really a case of not believing in it; they do not know of the possibilities. Now, I put it to you that if 20 p.ct. of the workers in the gas industry were to be "whole-hogged" convinced believers in the domestic uses of gas and coke, these propagandists would have such an effect on the community that very soon there would be no question about the elimination of the smoke nuisance.

THE COALLESS HOUSE PAYS.

I have proved to myself, continued Dr. Smith, that the coalless house pays, on fuel alone, against a house in which coal is used for heating the rooms and cooking. I have a house in which there are five bedrooms, and three or four rooms downstairs, in which there is no solid fuel, other than coke, used. There is central heating only for the halls and landings. In every room there is a gas-fire, of a pattern of the last three or four years; and the advantages of being able to make use of the heat when required, instead of having a coal fire burning continuously so as to be ready when needed—that intermittent use which is the condition of things in 90 p.ct. of our houses—renders it possible to employ a fuel which is more costly on the heat-unit basis, but which, taken all the year round, and utilized properly, is cheaper. Now I quite believe that it is not possible for this state of things to be generally brought about by casually getting people to adopt the application of gas to domestic purposes. It cannot be done casually; it must be done by proper maintenance, proper supervision, constant following-up, and good advice. The best policy for a gas undertaking is to encourage the consumer to use as little gas as possible, consistent with his using nothing but gas. I do not think it is always appreciated sufficiently that, when undertakings put fires into a house, these fires should be regulated to entail a minimum consumption for efficient service. If this were more generally done, gas would not cost the consumer as much as in many cases it now does.

COKE FOR DOMESTIC PURPOSES.

We can, however, Dr. Smith went on, regard the consumption of gas for industrial and general purposes as an approved thing. I want to say something about the application of coke to domestic uses. There has been a great deal of advocacy, and extensive research work, in the last few years in connection with the production of low-temperature coke; but what is the position to-day? I may be supplied with insufficient facts, but I have never been able to see how low-temperature coke can be an attractive and profitable proposition compared with the coke produced by the gas industry or with coal itself. I do not think it is ever going to be possible to force the community to use, for aesthetic or health reasons, a product which is dearer than another. It is necessary to provide the consumer with something which will take the place of that which is harmful, at a cost which is no higher. The gas industry is highly organized, and has unlimited powers of expansion; and its existing methods can be modified to give all the so-called low-temperature coke required under high-temperature conditions.

Present-day gas coke, if properly screened and reasonably free from moisture, and if made from coals which are not excessively high in ash—not above 8 or 10 p.ct. of ash—can be used with great advantage in the domestic grate, and I would like to suggest that demonstrations be organized by all the gas undertakings in order to show the community what can be done with coke which is properly sized, which is reasonably low in moisture, and which is not too high in ash. Even gas engineers are sometimes surprised at the possibilities of such a fire. Some people say you can use coke without all these qualities, if only you will adopt such-and-such a grate; but I am afraid you are never going to substitute coke for coal if you have to arrange for a very special form of grate. The average consumer may want to replace coal with coke if possible, but it has to be used in the average grate. It

is going into a very deep subject to discuss how best to get coke reasonably low in ash; but in the expensive forms of carbonizing plant in use at the present time it pays to purchase coal of such quality as will give a high-grade coke. Most undertakings are already able to supply entirely satisfactory coke for domestic purposes. You can go to the exhibition in the City Hall, and see a fire burning there continuously on coke taken haphazard from the Manchester Gas-Works; and the fire has a most excellent appearance.

Of course, coke is not as convenient as gas for the same purpose, but while solid fuel is used, and has to be used, the gas industry should push the sale of coke. Infinite possibilities exist in this direction. There are 35 million tons of coal annually being used for domestic purposes, and at the present moment there are available for sale only about 7½ million tons of coke. If a demand arose for coke in this direction to any appreciable extent, there would not be enough under prevailing conditions at the gas-works to supply it; but this could be remedied, because the conditions on the works could be arranged to maintain a balance between gas and coke.

Now as to the possibilities of producing, not the present coke, but a coke—if there comes a demand for it, which there is not yet—that is similar to what is normally obtained under low-temperature carbonization conditions. Recently experiments have been carried out which show that bulk carbonization can be effected at high temperatures, and with a resultant material which is practically identical with low-temperature coke. The conditions of manufacture are such that the economics are a considerable improvement on any system that has so far been put forward for low-temperature carbonization. Even if we acknowledge that low-temperature carbonization is a proved technical success, its economic soundness requires demonstration. It is not possible at present, and I do not see that it is likely to be possible apart from special conditions, to produce a low-temperature coke which will compare in price with domestic coal. On the other hand, I am quite convinced that the gas industry can produce all the so-called low-temperature materials with high temperature, and with economics as sound as they are at present—and they are very sound.

The Fuel of the Future.

Mr. F. W. GOODENOUGH, introducing his paper on this subject [see p. 431], said that for three days the conference had been listening to the case for smoke abatement from the point of view of public health and convenience, and they had been asking themselves: "What is the fuel that is going to enable us to solve the problem with which we all acknowledge we are faced?" His object was to present to them the case—which he believed could be thoroughly made out—for the products of the gas-works, gas and coke, to provide the community with the fuel of the future.

Mr. E. W. L. NICOL'S paper on "Gas Coke" will be found on p. 432.

Various members of the audience had some remarks to make concerning these papers.

Mrs. GEE (one of the several women speakers whose practical statements were keenly appreciated at different sessions of the conference) has found at women's meetings some objection to the use of gas for heating, on the score of its being injurious to health; and the responsibility for this feeling she places upon the doctors, who seem to be very prejudiced against gas. Therefore they must be converted. Again, working people find the cost of gas for heating very high, and it must be greatly cheapened before they can be persuaded to use it for this purpose.

Mr. J. WILLIAMS' experience has been of a doctor who said: "You are better off with a gas fire in the room than you would be with the dust and dirt of a coal fire;" so that once more doctors disagree. He named as the cause of all the trouble prevailing ignorance regarding the uses of gas, which can be employed for scores of purposes in the home for which it is not utilized now. What he suggested to the experts was that they are too modest in their advertisements; for he is satisfied that gas to-day, used with discretion, is cheaper than household coal.

Mr. EVAN ROBERTS, jun., asked, seeing that domestic fires are admittedly among the worst offenders, what is the best fuel to recommend.

Alderman GRINDLE (Eccles) uses Coalite, and has done so for twelve months; he has nothing but good to say for it. Indeed, he is quite satisfied that it will prove cheaper than coal.

Mr. CHARLES ROSS remarked that at Barton they claim to have solved the smoke nuisance; but people living there say the cure is worse than the disease. A little of the invisible smoke there goes a very long way indeed.

The Three Dots.

In his paper, Mr. Goodenough made an allusion to Lord Gainford's severe criticism in "The Times" of the claims made on behalf of low-temperature carbonization, and said that "the answer to this letter by Colonel Thwaites (the Acting Chairman of Low-Temperature Carbonization, Ltd.) omitted an essential quotation. He referred to a circular recently issued in the joint names of the Mines Department and the Department of Scientific and Industrial Research, and concluded his quotation with the words: 'To-day it is evident that the technical problems of carbonizing coal at low temperatures have been solved in all essentials.' Then he put three dots." Mr. Goodenough proceeded, as will be seen from his paper, to supply the finish to the quotation.

Lieut.-Col. THWAITES, "as the man who put in three dots, and left out part of the quotation," explained that he did it for the sake of brevity; but the letter went on to say that experiments on a large scale must go on before one could be quite sure that low-temperature carbonization was going to be a success. This was the case with all new processes. There seemed, in his opinion, in the midst of this conference, in the midst of all the smoke abatement exhibitions, and so on, to be a wish to boost one's own goods, rather than to discover the actual truth. The point to be considered was: "What on earth can we do to get rid of this horrible nuisance?" Unless they very carefully investigated all the various schemes, they would never get anything better. People should join these societies, and encourage every one who was doing his best.

Mr. GOODENOUGH: The way to arrive at truth is by controversy. As to doctors, at one time there was the same trouble in London as had been mentioned in the discussion; but after having had an opportunity of gaining practical experience for themselves, these doctors are now the strongest advocates and biggest users of gas fires. It is true the gas-fire costs more than the coal fire for constant use; but where a solid fuel is necessary, coke should be that fuel. An inspection of the coke fire on the Woodall-Duckham stand at the exhibition in the City Hall will convince anyone that the Manchester coke makes a most beautiful smokeless fire. Coke of this kind could be recommended as the best smokeless solid fuel that can be had at the present time.

LOW-TEMPERATURE CARBONIZATION AND SMOKELESS FUEL.

The session on this subject, which was presided over by Alderman Sir William Kay, had for consideration three papers, notice of two of which we are compelled to hold over, together with much other interesting matter, for a subsequent issue. We give this week, however, the paper by Mr. Harald Nielsen, and below will be found his introductory remarks, together with a statement by Dr. C. H. Lander, in the course of the subsequent discussion.

Some New Aspects of Low-Temperature Carbonization.

Mr. HARALD NIELSEN, in introducing his paper on this subject (which will be found on p. 434), said: As we are all here as the guests of the Smoke Abatement League, it is our duty to put our cards on the table, and to assist to the best of our ability in the solving of a problem on which I believe the future welfare of Great Britain and the British Empire largely depends. Any statements that I or my Company have published are open to any criticism, and I only ask that it may be constructive criticism, so that, by the elimination of weak points, this great subject may be helped forward to the benefit of the population and interests of this country. Neither I nor my Company wish to criticize detrimentally any process. We feel much too deeply on the matter, and we suggest that all people interested in this important subject should make a point of forming themselves into a Distillation Association affiliated to the Smoke Abatement League. Should this be done, all subjects can be scientifically and commercially discussed, and varying aspects considered. I and my associates are quite open-minded, and the moment it is proved to be scientifically and economically unsound we will discard the process with which my name is connected, and endeavour to help in the solution of the problem on lines which may appear more promising.

In "The Times" of Oct. 13, Lord Gainford put forward statements in a very concise manner. He explained how, in the minds of nearly everybody, high-temperature distillation and high-temperature products are confused with low-temperature distillation and low-temperature products, and went on to say that for the last twenty years low-temperature distillation has proved a "will o' the wisp." He showed clearly that the outcome of attempting to solve low-temperature distillation by high-temperature methods is simply to work in a circle. It is therefore essential to strike out in a new direction; and this my Company have done.

It is acknowledged that coal is a bad conductor of heat; and this difficulty can only be overcome by: (1) Employing a high-temperature gradient which is absolutely inadmissible in low-temperature distillation; (2) increasing the time factor enormously if low-temperature ranges are to be employed; or (3) multiplying the heating surface indefinitely. We decided on the last-named principle, and our retorting process is based on old-established drying practice, where it has been found that the only efficient means of drying material is to bring it into direct contact with a heating medium. We pass a superheated, inert gaseous medium into direct contact with the fuel to be distilled, and in this way get the best and most efficient heat interchange. We can bring our carbonizing period down to a minimum, and in addition we are able to employ single units of more than a hundred times the size of externally heated units. The capital cost and working cost will consequently be greatly reduced, and will enable the resultant fuel and bye-products to compete with the raw fuel and imported oils.

Again referring to Lord Gainford's letter, he mentions one of the best-known German authorities in coal carbonizing—namely, Dr. von Thau. The latter says: "The difficulty of finding a sufficiently wide market for low-temperature coke hinders the development of the industry, especially as the quality of the product is still capable of much improvement." This is true, as the conditions under which a good carrying coke is formed are in entire opposition to low-temperature principles, except in isolated cases. I maintain that all the retort should be called upon to do is to effect an economic separation of solid, liquid, and gaseous products from the raw material; and if a good carrying coke is

desired, special attention must be paid to this subsequently by briquetting. It is just as impossible to produce pink and blue aniline dyes from the same pot as it is to satisfy all low-temperature demands for high-grade products in one single operation. Dr. von Thau is very well aware of this fact, and it might interest you to hear his views on our process, as expressed by him in the Standard German work on "Industrial Uses of Fuel," by de Grahl. On p. 592 he says: "The best solution of the subject of low-temperature carbonization appears to have been obtained by the well-known expert, Mr. Nielsen."

VIEWS OF THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

Dr. C. H. LANDER (Director of Fuel Research under the Department of Scientific and Industrial Research) said: We have heard this afternoon the views on low-temperature distillation of three of the groups who are attempting to find a commercial solution of the problem of smoke pollution along certain well-defined lines. A technical attack upon the problem may be made in two directions, according as raw material is heated from the exterior by conduction through the walls of the retort, or internally by conversion of hot gases either generated inside the retort or fed in from the outside. I do not, however, propose to enter into a discussion of the technical aspect of the question, but wish to draw attention to the views on the national aspect of the matter held by the Department which I have the honour of serving.

Reference has already been made to a statement recently issued by the Mines Department and the Department of Scientific and Industrial Research, and quotations are taken from the document. I wish, however, to expand somewhat the sentence in one of the papers which states: "The report goes on to emphasize the need for large-scale production on a commercial basis." In this connection, I want to strike a note of warning from the national point of view, and to tell you what the view actually is that is taken by these two Departments. The view taken is that no one can say definitely whether commercial success is possible, and that this can only be demonstrated when a plant of sufficient size has been in operation for some years, so that the problem can be reduced to one of mere commercial audit. If after steadily working for some time in this way, any of the groups interested can demonstrate their success in this practical manner, then the time is ripe for "large-scale production on a commercial basis," and I have no doubt whatever that those industries interested will take the matter up with vigour.

Reference has also been made to a report of a test on a "Parker" plant made under the scheme recently announced by the Government. It is a technical report confirming the claims made by the Company as to the production of oils and gas, &c. The report says that these claims are substantiated; that it actually "produces the goods." There is, however, a rather qualifying prefatory note, signed by myself, which I should like to read:

> The object of these tests is to place in the hands of those interested accurate technical data on the quality and quantity of yields, the throughput of the plant, the working temperatures, and the general ease of working, together with such other information as it may be possible to obtain under the limited conditions of the tests. It should be clearly understood that no attempt is made to pronounce on the commercial possibilities of plants which may be tested. The likelihood of commercial success can only finally be judged after working a plant under a steady load for a long period, and in the light of complete knowledge of local conditions, such as cost of raw material, quantity of raw material available, price and markets for products, cost of labour, &c.

In other words, the report places in the hands of industrialists or others who may possibly be considering the erection of low-temperature plant accurate technical data from which they can, in the light of their own local circumstances, make their own prophecies as to the likelihood of commercial success. No one else can do that. Such considerations involve many important factors, such as the present prices of raw material and products, and the trend of future prices. It must not be forgotten that large developments in this direction will in themselves affect such prices.

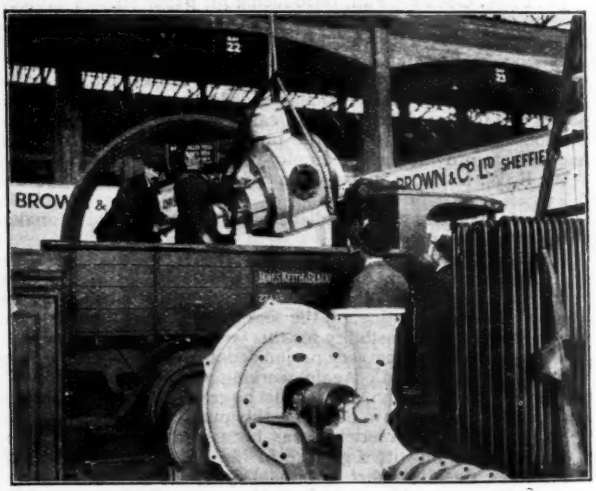
I must also refer to the recently-issued annual report of the Committee of the Privy Council for Scientific and Industrial Research, which states that:

> Low temperature carbonization of coal is attractive, since it produces both smokeless solid fuel useful for domestic and industrial purposes, and a supply of motor spirit and of liquid fuel needed for the navy and mercantile marine. It would not be a specific for all our troubles even if it could be profitably adopted for the 40 million tons of coal annually used in domestic fireplaces. Owing to the variation in the coals available, and in the local conditions, a number of different processes will possibly have to be devised before success on a national scale is achieved. It is quite certain that no single process has yet become established which would be suitable for application on a national scale. Before it would be feasible to prohibit the use of raw coal in our homes, it is therefore necessary to find a process and a type of plant—or a number of processes and types of plant—which collectively would pay their way when the raw coal is purchased at approximately the same price as coal now sold for household or other general purposes.

In consideration of the problem from the national standpoint, it is important not to lose sight of the considerable benefits and indirect savings which would follow the use of smokeless fuel or gas on an adequate scale. The taking of such savings into consideration can only be effected by parliamentary action of some kind. When the innate conservatism of the British public is taken into account, however, it will be admitted that such action could only follow the education of the public in the manifest advantages offered by development in the use of such fuels. The labours of organizations such as the one to which this conference is due cannot be over-estimated, since the alleviation of the smoke nuisance, whether by the methods discussed this afternoon or by any other sound system, can only be achieved by the enlightenment of the consumer in the direction of his best interests.

VALE! WEMBLEY, 1924.

Dismantling a Gas Engine.



Loading-Up the "K.B." Exhibits.

Electricity from Gas Engines at Oakham.—The "Power Engineer" for November gives a description of the gas-engine plant which is generating electricity at the works of the Oakham Gas and Electricity Company, Ltd. Owing to the extensive area of supply, and its scattered nature, single-phase generation and distribution has been adopted at a pressure of 250 volts. An account of the installation (for which Mr. A. Hugh Seabrook was the responsible Engineer) was given in the "JOURNAL" for Sept. 10.

The Gas Turbine.—Last week, at a meeting of the Bradford Engineering Society, Mr. Hugh Campbell, of Halifax, gave a lecture on the "Gas Turbine." He stated that, from the practical side of the subject, the problem was much more difficult than many people believed. Having described the essential features of the gas turbine in its simplest form, Mr. Campbell explained that the difficulties hitherto experienced were mainly of a metallurgical character, as the turbine disc, nozzles, and blades have to withstand a temperature of 2500° Fahr., with pressure up to 300 lbs. per sq. in. Hence a new material will have to be found capable of maintaining not only its strength, but also its form under the temperature and pressure mentioned. An interesting discussion followed, in which Prof. Charnock took a much more hopeful view of the situation than the lecturer. He thought that the difficulties had been exaggerated, especially as regards the temperature and pressure which the disc and blades were called upon to withstand.

THE FUEL OF THE FUTURE.

By F. W. GOODENOUGH, Executive Chairman of the British Commercial Gas Association, and Joint Hon. Secretary of the National Gas Council.

[A Paper read at the Smoke Abatement Conference in Manchester, Nov. 6.]

THE ESSENTIALS.

For the progress and prosperity of the country it is essential that the fuel used in our homes and our factories should—with the minimum of cost to the consumer, taking all factors into account, with the smallest necessary demand on the nation's coal resources, and with the greatest possible economy of transport—assist the manufacturer to secure maximum high quality output per square foot of factory and per head employed; reduce household drudgery to a minimum; preserve the valuable chemical substances in coal from which are derived the raw material for many industries; and avoid the pollution of the air and the darkening of the skies by smoke.

COAL OUR ONLY FUEL.

In this country fuel is the only considerable prime source of light, heat, and power; and the only considerable supply of fuel lies in our coal-beds. We not only have no Niagara, but nothing approaching it as a source of water power. We have no native oil supplies, and our resources of wood and peat are negligible.

The subject of the coal and power resources of the country is very much under discussion at the present time. It is important to remember that, whether we use power through the medium of steam, gas, or electricity, we need coal for its production. Electricity is dependent upon motive power for its generation. It is not a self-creative force; it is in this country a derivative of coal (not a substitute for it), just as are gas and steam. Electricity is a means for the transmission of power, not a source of power; a product, not a creator.

OUR PRIME SOURCE OF HEAT AND POWER.

Again, it is important to remember that coal is not only our great prime home source of power; it is also our prime home source of heat. Therefore it is vital to our industrial prosperity to make the best use of our coal in every way. The problems attending the provision of power and heat for our homes and factories in such a way as to cheapen and improve output, abolish dirt and drudgery, supply the raw materials to our chemical industries, conserve our coal resources, and abolish the smoke curse, are separate and distinct.

Power is one thing, heat is another. They can only be confused at grave risk to national interests. The national problem is not merely coal and power, but coal as our source of light, heat, and power. The solution of the power side of the problem is mainly electricity, though by no means wholly so, as gas is the more economical in many circumstances. The solution of the heat side of the problem—whether for cooking, warming, or industrial processes—is almost wholly gas and coke. It is not within the purview of this paper to discuss the question of light; but it may be said that, from the point of view of coal conservation, the balance of advantage is in favour of gas, though by no means to the extent that it is so in connection with heat.

USES OF ELECTRICITY.

Electricity for light, power, and medical and scientific purposes has an immense and growing field of usefulness, and its economic development should be encouraged by every means that does not put the cost upon other industries through State subsidies. To distribute heat derived from coal in the form of electricity is, however, a most wasteful and costly proceeding, and should be clearly differentiated from the other uses of electricity. To distribute heat derived from coal in the form of gas and coke is true economy, alike for the nation and the consumer. For the evidence upon which these statements are based the community is indebted to important investigations carried out and reports made by Sir Dugald Clerk, in collaboration with Profs. J. W. Cobb and Arthur Smithells.

ITS LIMITATIONS.

Owing to the report of a Sub-Committee of the Ministry of Reconstruction during the war, and to the rosy pictures painted by politicians framing a popular programme—with, as a leading feature, the transformations it is suggested might be effected in domestic and industrial life in every hamlet, town, and city, by the magic wand of Electra—an impression widely prevails, among those who have not studied the subject scientifically, that the extended use of electrical energy as a fuel—that is, for heating and cooking—as well as for lighting and power purposes, would effect an economy in the consumption of coal, would, indeed, conduce to coal conservation. The facts revealed by scientific examination put a very different complexion on the matter. The average electric generating station delivers to the consumer less than 8 p.ct. of the heat in the coal it uses; the most economical, less than 20 p.ct. From 80 to 95 p.ct. is now lost, and not less than 80 p.ct. is estimated will be lost in the largest and most economical contemplated super-station. The loss of heat in the coal used in a gasworks is less than 25 p.ct.

Sir Dugald Clerk, in a lecture before the Royal Society of Arts on "The Distribution of Heat, Light and Motive Power by Gas and Electricity," showed that to do equal heating work for the consumer, after allowing in both cases for all losses in transmission and utilization, there would be a destruction of 4 tons of coal at the electric generating station of to-day as compared with 1 ton at the gas-works, or 3 tons at the super-station of the future as compared with 1 ton at the gas-works.

THE BYE-PRODUCTS OF CARBONIZATION.

Moreover, in the process of the generation of electricity by coal burnt under steam boilers (the most economical means known of generating electricity in large quantities other than by water power), there are destroyed all those valuable commodities so vital to our manufactures, to our agriculture, to our road and air transport services, and to our armament—benzole, carbolic, creosote, pitch, toluole, sulphate of ammonia, cyanide, &c.—which are recovered as bye-products when coal is carbonized at the gas-works.

HIGH VERSUS LOW TEMPERATURE CARBONIZATION.

The only established economic method of obtaining the gas and coke from coal, and securing the chemical bye-products vital to us in peace and war alike, is that of high-temperature carbonization, as carried on in the gas-works of to-day. The claims made for low-temperature carbonization as an economic method of dealing with the coal resources of this country have not been established, although exhaustively investigated by the Ministry of Munitions and the Fuel Research Board. Those claims were recently submitted to severe criticism by Lord Gainford in a letter in "The Times," and the answer to that letter by Colonel Thwaites (the Acting Chairman of Low-Temperature Carbonization, Ltd.) omitted an essential quotation. He referred to a circular recently issued in the joint names of the Mines Department and the Department of Scientific and Industrial Research, and concluded his quotation with the words: "To-day it is evident that the technical problems of carbonizing coal at low temperatures have been solved in all essentials." Then he put three dots. Let me supply the finish to his quotation. The report to which he referred added:

". . . but before we can safely introduce the process with a prospect of financial success, further large scale work—mainly on engineering problems—remains to be done. There have been a number of partially successful solutions. A process may make successful use of types of coal which under present conditions command little more than the price of waste products and produce a smokeless fuel which sells at the price of good raw coal, while the bye-products of the process may command a price which would not be obtainable if the supply were large.

"It is one thing to evolve a process which may be a commercial success on a relatively small scale, and quite another to apply it universally. Yet it is only by the solution of the problem on a scale of national importance that any ultimate effect on the state of employment and the industrial prosperity of the country can be produced."

THE ESTABLISHED CARBONIZATION INDUSTRY.

It is hardly necessary to add that had low-temperature carbonization proved to be both technically and financially the right method of dealing with the coal resources of this country, it would have already been adopted by the established coal carbonization industry—that is, the gas industry.

The facts that I have given are interesting, important, and, I think, conclusive, from the national and communal points of view. The case for gas fuel economy is up to that point absolutely conclusive; but there remains to be considered fuel efficiency from the point of view of cost to the individual user, because if it is more costly for him to use gaseous fuel than to use crude coal, he will, if he is a business man, feel compelled, and if he is a private householder, be strongly inclined, to continue to use crude coal, in spite of the arguments in favour of gaseous fuel from the public point of view. This is human nature, and we cannot make it the subject of complaint—we have to deal with it as practical people.

RELATIVE FUEL COST.

How do the cases stand for the use respectively of (1) gaseous fuel, (2) crude coal, and (3) electricity from the individual consumer's point of view? First of all, it is necessary to point out and to emphasize strongly the fact that in considering this aspect of the question we must have regard not merely to fuel cost compared with fuel cost, but we must take into consideration the domestic or industrial budget as a whole—we must take into account the questions of waste or economy of transport, health, energy, time, storage space, &c., to which I have already referred, before we can pass a final verdict as to comparative cost in any given case.

For continuous firing, either for industrial or for domestic purposes, fuel cost for fuel cost, gas at any price at which it can be commercially supplied to-day is dearer than coal or coke. For intermittent use, gas is generally as cheap, and sometimes actually cheaper, and by reason of its incidental economies easily holds the field.

COST COMPARISONS.

The following I believe to be reliable comparisons of the fuel cost of useful heat to the consumer obtained by the use respectively of coal, coke, gas, and electricity. I have taken coal and

coke at 50s. per ton, gas at 8d. per therm, and electricity at 1d. per unit.

	Per Therm or Useful Heating.*
Coal	costs from 9d. to 27d. (*a*)
Coke	,, ,, 8d. to 12d. (*b*)
Gas	,, ,, 10d. to 18d. (*c*)
Electricity	,, ,, 30d. to 40d. (*c*)

* That is, heat which does useful work for the user, as distinct from that wasted through the inefficiency of utilization or through the unavoidable burning of fuel at times when heat is not needed.
(*a*) According to whether required for regular or intermittent heating.
(*b*) Only comparable in cases where fairly constant heating is required.
(*c*) According to efficiency of utilization, varying in different processes.

It will be seen that for constant use coke is the cheapest fuel if cost of fuel alone is considered. This is particularly so in regard to steam raising, as to which very important figures of practical experience have been published and are available (though space will not allow me to quote them, they will doubtless be given in another paper).

The figures also show (and they are supported by experience) that gas used in the most favourable circumstances is actually cheaper in direct fuel cost than coal used in the most unfavourable circumstances, and *vice versa*. Comparisons between the two depend entirely upon the circumstances in which fuel is required and used.

Intermittent Supply.

For intermittent use gas easily beats all comers. No one would suggest using coke for intermittent heating, and for that reason I have included no figure for its cost in such circumstances. As an actual and striking instance of gas showing a direct money economy over coal, I may mention that at an infirmary in London some time ago gas cooking stoves were installed in all the ward-kitchens in place of coal ranges, with the result that a saving of no less than £1200 a year was effected in the fuel bill, without making any allowance for the savings effected in labour, dirt, and the heavy wear and tear on the coal ranges. The coal required to produce the gas consumed in lieu of the coal burned in its crude form shows a saving of 400 tons of coal per annum, *plus* 100 tons of coke available for sale. That is a striking, but by no means a solitary, instance of gas fuel efficiency. But when we consider comparative costs when heat is required for considerable periods, there are, as I have already indicated, a number of important considerations other than actual fuel costs to be taken into account. We have to draw up a balance-sheet.

Gas Effects Savings.

The substitution of gas for coal in industrial processes frequently results in the saving of so much in stoker's wages and other incidental expenses as to effect a substantial economy to the user, in spite of the cost of the gas consumed being greater than that of the coal formerly burned. Again, the use of gas in industrial processes, by reason of the constant maintenance of temperature and the possibility of exact heat regulation, frequently leads to a higher and more uniform quality of product, a much lower percentage of rejects, and a greater certainty of output. It, moreover, frequently results in an increase of output per machine per hour, and furthermore secures healthier and less exhausting conditions for the employees engaged in the operations. I could give many actual instances to confirm these statements and to show that gas enables the manufacturer to reach a higher percentage of efficiency in his processes than he could achieve with the use of solid fuel; but space and time will not permit. Where, however, after taking all attendant factors into consideration, the cost of gaseous fuel is found to be too high, coke will generally be found the best means of securing fuel efficiency.

The Budget as a Whole.

What is true in the factory and workshop is also true in the home. The budget must be taken as a whole. The consumer's standpoint must, in fact, be considered not by an examination of fuel costs alone, but in the light of incidental economies of all kinds. Due allowance must be made for saving effected in connection with building costs, and therefore rents; wear, tear, and cleaning both of the building and more particularly of its contents; storage space for fuel, and the rent for such accommodation; service costs—a very considerable item; the drain upon not only the time but the nervous energy of the housewife, which, though unpaid, has an economic value; and expenditure of nervous energy directly or indirectly by other members of the household, with its not unlikely consequences of doctors' bills or deterioration of earning capacity. Some of these factors are often neglected, but they are far from negligible; and it would be easy to illustrate the truth that these and other matters are closely related to domestic economy, as they are largely dependent on the choice of the domestic fuel. They should certainly figure as prominently in the domestic budget as the more obvious, but often misleading, item represented by fuel costs alone.

Summary.

To sum up, I am of opinion that gas, with its companion bye-product, coke—already rapidly increasing in favour and use—will by progressive degrees become the fuel of the future, because the gas-works supply to the community as gas, coke, or chemical products from 75 p.ct. to 80 p.ct. of the total heat value of the coal delivered to them; because the gas-works recover from the coal the raw materials for dyes, drugs, disinfectants, motor fuel, fertilizers, &c., which are destroyed when coal is burned in its crude state; because gas requires no road transport for its delivery to consumers; and because gas is a smokeless fuel which can be adjusted to and maintained at the desired temperature, need only be consumed as and when required, involves no dirt or labour before, during, or after use, and has been tested and unreservedly approved as the most hygienic means of heating by thousands of medical men—because, in short, gas fulfils all the requirements set out in the first paragraph of this paper, except as to cost for constant heating, and then its companion product, coke, supplies the want.

GAS COKE

IN RELATION TO INDUSTRIAL AND DOMESTIC SMOKE PREVENTION AND FUEL ECONOMY.

By E. W. L. NICOL, of the London Coke Committee.

[**Extracted from a Paper read at the Manchester Smoke Abatement Conference.**]

Pulverized Coal as Fuel.

Finely pulverized coal can be consumed smokelessly and efficiently; but it is well known that the degree of efficiency attained in the combustion of pulverized coal varies with the degree of fineness; and, unfortunately, the extreme degree of pulverization necessary to maintain a reasonably high efficiency entails the risk of emission of fine ash from the chimney with the other products of combustion. Notwithstanding this disadvantage, pulverized coal has usefully been applied to various types of metallurgical furnaces; but its application to existing types of steam boilers on a large scale is fraught with other serious difficulties. Comparatively large furnace volume is necessary in order to obtain good results. This entails additional cost in adapting boiler plant where such adaptation is possible, and this, of course, renders the use of a substitute fuel impracticable in case of emergency; but the emission of fine ash from the boiler chimney is by far the most serious obstacle to the general adoption of this system as a means of smoke prevention. From 80 to 85 p.ct. of the ash contained in the coal, it has authoritatively been stated, is dispersed from the chimney top in this way; and in cities and towns the resulting nuisance would be infinitely worse than that of smoke.

Influence of Coke upon Atmospheric Sanitation.

The direct and growing influence of coke in mitigating the domestic smoke nuisance may be gauged from the following figures:

An ordinary independent coke-fired hot-water supply boiler which, in conjunction with a gas cooker, eliminates the necessity for a kitchen range, consumes about 5 tons of coke per annum, as a minimum. The present monthly output of one maker of coke-fired boilers is over 400, or 4800 boilers per annum. This output alone represents an annual increment in demand for coke of 24,000 tons, which not only displaces at least an equal weight of coal, but incidentally entails in its production the manufacture of some 625,000,000 c.ft. of gas, which also must find a use in lieu of coal. There are already some forty British firms specializing in the manufacture of independent coke boilers, and other coke-consuming domestic appliances.

In the industrial field, the influence of coke in preventing smoke emission is no less important; and its use for many industrial purposes has not only proved to be practicable, but also economical. Coke is now used exclusively as fuel, in lieu of coal, in many hand-fired steam boilers of all descriptions and capacities. Coke is used also by means of a comparatively new type of forced-draught mechanical stoker, which is applicable to the largest steam boilers.

Coke as a Diluent to Coal.

The Sandwich System of Fuel Blending.

Probably one of the most important directions in which coke has been introduced recently is at electrical power stations. For economic reasons coke is not used exclusively, but as a diluent to coal, and as a means thereby of not only effecting the smokeless combustion of coal, but also of facilitating the efficient use of low-grade, but relatively cheap, classes of bituminous coal which otherwise are often considered unsuitable, and frequently unsaleable. The importance of facilitating the efficient use of such low-grade classes of coal, from the national economic point of view, may be gauged by the fact that it has been stated on the highest authority that the quantity of this material buried in the mines amounts to some sixty to seventy million tons per annum.

How coke is made to function in this important and economical way will be clear from the following explanation of the Sandwich system of fuel-blending. Ordinary bituminous coal slack contains 28 p.ct., or more, of smoke producing volatile matter; coke contains about 2 p.ct., or less, volatile matter, while smokeless steam coal contains about 14 p.ct. Mixed in equal proportions of bituminous coal and coke, the composite fuel would have the following analysis:

Proximate Analysis of Fuels used by Means of the Sandwich System.

—	Coal.	Coke.	50 P.Ct. Coal and Coke.
	P.Ct.	P.Ct.	P.Ct.
Volatile matter	28·0	1·0	14·5
Fixed carbon	57·9	89·0	73·25
Ash	14·5	10·0	12·25
Calorific power, B.Th.U.	10,780	11,500	..

Proximate Analysis of Typical Smokeless Coal.

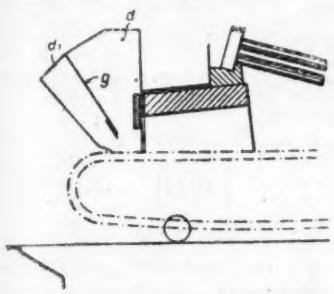
	P.Ct.
Volatile matter	14·0
Fixed carbon	76·0
Ash	10·0

From the above analyses it will be seen that the proportion of coal to coke may be so adjusted that the analysis of the composite fuel, as fed to the furnaces by mechanical means, may be identical with that of relatively expensive Welsh smokeless coal.

The Sandwich System.

It should here be pointed out that it is not necessary or permissible intimately to mix the coal and coke in order to obtain the required results. Indeed, there are probably few power-station engineers who have not tried and failed to burn on ordinary chain-grate mechanical stokers any considerable admixture of coke with bituminous coal. The invariable result of this experiment is a "misfire"—that is to say, the furnace is cooled to such an extent by the slow combustion of the mixture, that there is failure to ignite the fuel as it enters the furnace, and the fire "goes out."

The efficacy of feeding the coal and coke in separate superimposed layers was first discovered by the author while experimenting with coke breeze during a period of acute coal shortage. The automatic "sandwiching" of the coke layer between the moving chain-grate and an upper layer of coal slack was accomplished by the simple expedient of fitting an adjustable division plate *g* in the coal feed-hopper, as shown in the diagram.



"Sandwich" System of Feeding Coal and Coke Applied to Chain-Grate Stoker.

Thus the coke is fed on the moving grate from hopper *d*1 in a layer of any required thickness; and from hopper *d* a layer of coal slack is fed upon the coke layer; the correct proportion of coal to coke being adjusted by means of the guillotine doors or shutters shown in the diagram.

The precise proportion of coal to coke is determined by the analyses of the two fuels, and also by consideration of relative price and calorific power; the fuel showing the greater calorific value being used to the utmost extent consistent with good results. Usually, a 50 p.ct. mixture gives smokeless combustion and is considered most advantageous from the financial as well as the practical viewpoints.

That the Sandwich system of fuel blending has been used continuously for some years at several of the most important power stations in this country, is sufficient proof of its commercial utility and adaptability; but the precise improvement in thermal efficiency realized at one power station by means of the Sandwich system—namely, 19 p.ct., is shown by the following results of alternate tests with coal alone and with coal and coke, which have been supplied by one user:

Results of Alternate Tests.

—	Test No. 1. Coal and Coke.	Test No. 2. Coal Only.
Calorific power as fired	11,138 B.Th.U.	12,150 B.Th.U.
Fuel consumed per grate foot hour.	30·66 lbs.	31·66 lbs.
Ash and clinker, actual	16·22 p.ct.	12·7 p.ct.
Average steam pressure	178 lbs.	179 lbs.
Superheat temperature	486° Fahr.	490° Fahr.
Water evaporated per hour	10,505 lbs.	8747 lbs.
Water evaporated per sq. ft. of heating surface.	5·22 lbs.	4·35 lbs.
Water evaporated per lb. of fuel as fired, from feed temperature	7·18 lbs.	5·76 lbs.
Water evaporated, from and at 212° Fahr.	9·22 lbs.	7·44 lbs.
Efficiency of boiler and superheater	69·9 p.ct.	53 12 p.ct.
Efficiency of boiler with economizer	79·96 p.ct.	60 98 p.ct.
Draught over fire	0·25 in.	0·25 in.

From the above figures it will be observed that not only is the thermal efficiency of the boiler plant very materially improved by using the composite fuel, but the evaporation per pound of the mixture, although of lower calorific power, is higher than that of the coal only; and, moreover, the output of steam per boiler is greater by 20 p.ct.

The last-mentioned point, coupled with the fact that practically smokeless combustion is maintained, enables the Sandwich system to compete successfully with pulverized coal-firing, as it ensures good results with the cheapest class of fuel and does not entail the use of coal-crushers, grinding mills, coal drying plant, special conveyors and storage bins, burners, and other accessories, or the danger incidental to the use of pulverized coal as fuel.

Power Station Engineers on Economies Effected by Means of Coke Fired on the Sandwich System.

Engineers responsible for the operation of important power stations using the Sandwich system have reported officially as follows:

1.—"Owing to the increased use of coke and coke breeze, a saving of £8000 a year can be effected."—London County Council Tramways Department.

2.—"Apart from the saving in money, low-grade classes of fuel can be dealt with on the Sandwich system at a much higher efficiency than would be the case if burned separately."—Highways Committee Report to the London County Council.

3.—"Coke breeze is being burned with coal on the Sandwich system, and, although the load factor is only 25·6 p.ct., the cost of fuel per unit sold, 0·34d., is the lowest recorded this year for any undertaking in this country."—"Electrical Review," *re* Darlington Corporation Power Station.

4.—"The proportion of volatile matter was approximately 8 p.ct. of that of coal only. This would appear to constitute an important element in determining the thermal efficiency of the boiler, for the reason that the hydrocarbon loss is minimized due to the reduction of the volatile matter in the combined fuel. The thermal efficiency obtained showed a difference of 19 p.ct. in favour of the Sandwich system."—An Important London Power Company.

5.—"After eighteen months' experience with the Sandwich system of fuel blending on a large scale at a power station using on the average 3000 tons of fuel per week, I have come to the conclusion that the use of this system has introduced a new line of thought in fuel use which has many important advantages from both the commercial and national points of view. Equipped with divided overhead storage bunkers, and other facilities for blending at the boiler furnaces, the combinations which can be secured are practically infinite. By means of a simple system of trial and error, the most advantageous mixture, having regard to price and all other factors, is readily determined; and high thermal and commercial efficiency can thus be maintained which, without the control and elasticity incidental to the Sandwich system, would be impossible."—The Power Station Engineer to one of the largest public utility authorities.

Most smoke reformers have been accused of having "an axe to grind" or some personal interest to promote; and the above quotations taken from the reports of responsible engineers certainly do read not unlike a company-promoting prospectus; but the author disclaims any such motive or intention. His main object is, frankly, to promote the use of coke as fuel on its merits, and thus to further the interests of the London Coke Committee. The fact that by so doing the dual causes of fuel economy and smoke abatement are also promoted has been a great incentive and encouragement; but it is indeed gratifying to know that the introduction of coke as fuel, and the economies incidental thereto, have brought about modifications of an important character in fuel practice, not only at existing electric power stations, but also in the design of important new power stations, so that, from the outset, coke can be used, along with relatively cheap grades of coal slack, and thermal efficiencies realized which are much in excess of former experience.

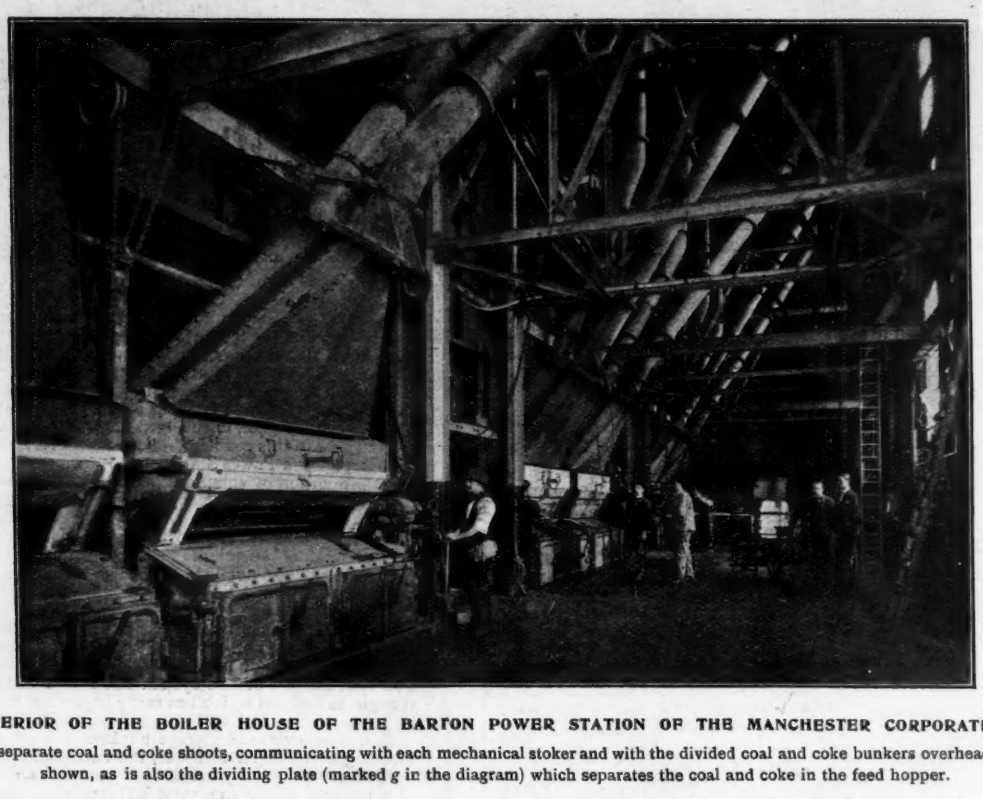
It is gratifying also to find, on attending this Smoke Abatement Conference at Manchester as a representative of the Institution of Gas Engineers and the London Coke Committee, that the new power station of the Manchester Corporation at Barton, which delegates and members of the Conference have been privileged to inspect, is not only designed to operate, as and when required, on the Sandwich system of coal and coke firing, but that it is classed officially by the Electricity Commissioners in their recent report as the most efficient power station of its class in this country.

Incidentally, and having regard to the well-known enterprise and business acumen of the Manchester Corporation, it may safely be assumed that, by utilizing coke or coke breeze at the power station, a new and important outlet for coke has been created, of mutual and material benefit to both the Electricity and the Gas Departments of the Corporation, and, through them, to the citizens of Manchester, by the provision of relatively cheap electricity and smokeless operation of the power station. That this system of firing has been adopted by Manchester, following upon experience in London, is indeed a significant reversal of the usual order of events well worth recording; but it is still more significant that coke-firing should be adopted at Barton in spite of the promised advantages of pulverized fuel systems of foreign origin.

Conclusion.

Nothing is more certain than that the world demand for petroleum and petroleum products must ere long exceed the available world supply; and while we may enjoy to the fullest extent the felicity and prosperity which petroleum has brought us, it must be borne in mind that coal and coal products are, and must remain to an ever-increasing extent, the mainstay of our industry and power as an Empire.

It is equally certain that an adequate and independent supply of liquid fuels must remain a factor of vital importance in peace,



INTERIOR OF THE BOILER HOUSE OF THE BARTON POWER STATION OF THE MANCHESTER CORPORATION.

The separate coal and coke shoots, communicating with each mechanical stoker and with the divided coal and coke bunkers overhead, are shown, as is also the dividing plate (marked *g* in the diagram) which separates the coal and coke in the feed hopper.

as in war. If Great Britain and the Dominions are to escape a costly and increasingly precarious dependence upon the diminishing resources of foreign countries, our coal deposits must be made to yield the liquid fuels we require.

All authorities on the subject are agreed that our coal can, and should, be made to yield such fuels in adequate quantities; they differ only as to the method, or methods, by which the agreed common object should be accomplished. It is quite clear, however, that whatever method or methods may be adopted, coal distillation must eventually be carried out on a scale hitherto undreamed of in this country if smokeless fuels and liquid fuels adequate to the country's requirements are to be internally produced.

The disposal of the solid product, coke, has in the past been a serious obstacle to large-scale coal-carbonizing operations. The introduction of coke-burning domestic appliances and coke-burning mechanical stokers at electricity and other power stations has to a large extent eliminated this difficulty. The development of power from our coal resources must, in fact, begin with distillation and bye-product recovery; and the carbonization of coal can be carried on commercially on an adequate scale only by gas supply authorities who possess not only the necessary knowledge and experience, but also the means of distributing and marketing the gaseous and other products of the process. From the national economic point of view, electricity generated directly from raw coal is, relatively, a wasteful means of converting and distributing potential energy; 80 p.ct. of the heat value of the coal being lost in the process, and also the whole of the recoverable bye-products. Coke-fired power stations stand, economically, in a different category.

The coke at present produced at British gas-works—*i.e.*, 8,000,000 tons per annum—is more than sufficient to produce smokelessly and efficiently the whole of the electricity publicly distributed in this country; and the output of coke is increasing daily. At several of the largest power stations in London and in the provinces coke is now used, on its merits, in conjunction with low-grade coal slack by means of the Sandwich system of firing. These power stations are among the most efficient from both the thermal and the commercial points of view; and from the national economic point of view they undoubtedly are the most efficient power stations. Apart from its smokeless characteristic, and compared with raw or pulverized coal, the practical and economic advantages of coke as fuel for the production of power include the following:

(1) There is practically no difference between the gross and the net calorific powers of coke.
(2) Coke requires less furnace volume than coal.
(3) Coke facilitates the use of low-grade coal, which is now rejected and buried in the mines to the extent, according to the highest authorities, of 60 or 70 million tons per annum.
(4) Coke is smokeless, and requires the minimum excess of air to effect its complete combustion.
(5) The efficiency of combustion of coke under suitable conditions is about equal to that of pulverized coal.

The advocates of powdered coal have stated that one of its great advantages is that it eliminates the necessity for removing ash and clinker, simply because 80 to 85 p.ct. of the ash is projected from the chimney shaft. No difficulty of this description has arisen from coke-fired boilers.

LOW-TEMPERATURE DISTILLATION.

By HARALD NIELSEN, M.I.Chem.E., F.C.S., A.M.I.M.E.

[Extracted from a Paper read at the Manchester Smoke Abatement Conference]

A great many people believe that low-temperature distillation is something like a conjurer's hat, out of which can be produced all sorts of valuable products which will effect a lightning cure for all industrial evils, and whereby electric power can be produced in bulk, the Navy rendered independent of foreign oil fuel supplies, the sun made once more to shine brightly, and mountains of waste dumps turned into gold. There is no end to the statements as to what can be produced from all sorts of coal and shale under any conditions, in any form of retort.

Low-temperature distillation is essentially a plain business proposition which must be seriously considered, first from the scientific side, secondly from the practical and engineering aspect, and finally from the purely commercial point of view. Naturally, the latter in the long run will be the most important for the general and economic welfare of this country as a whole.

The standard laws of supply and demand are the governing factors of low-temperature distillation. The products must be sold in competition in the open market with similar products from other sources, and with the raw material from which the products are extracted. The solid residue, which is generally by far the largest percentage, must be sold at a price which renders it attractive to the manufacturer and householder alike, irrespective of its smokeless combustion and other virtues; and here it must be stated that the original raw coal is the most formidable competitor, consequently the sale price for the solid residue must not be higher than that of the raw material. The man in the street will never believe that the mere fact of removing some valuable products from the fuel will justify a higher price for the residue—it is more likely to be the other way about.

Then there are the oils. Here again the market prices for well oil and gas-works tar will be the governing factors. To-day nobody can state the true value of low-temperature distillation oils, as far too little research work has been carried out on them. A mere fractionating is no guide whatsoever; and degree of saturation may tell us something, but not much. Many get enthusiastic over a somewhat high yield in lighter fractions, while possibly the heaviest lubricating and grease fractions may prove by far the most valuable. We must realize that present-day knowledge of low-temperature oils is still in its infancy; and it must of necessity take a considerable time before the low-temperature liquid products are understood to the same extent as high-temperature

products. We must also give up the fallacious idea that any large yield of sulphate of ammonia may be reckoned on to swell the budget when low-temperature distillation is employed. At the most a few pounds can be obtained; and it is doubtful whether the recovery will pay in other than a few isolated cases.

The gas obtained will form a source of revenue; but any extra large yields stated in conjunction with a large oil yield must be looked upon with suspicion. It must be remembered that most of the illuminating and high calorific value components of the gas are due to the secondary decomposition of the original liquid primary products, so of necessity a large gas yield spells a lesser oil yield; and when working under proper low-temperature conditions, 3000 to 3500 c.ft. of gas is the most that can safely be reckoned upon. The introduction of the therm has added an enhanced value to the low-temperature gas whenever there is a sale for the gas as a town gas.

Economic Question.

Bearing the above considerations in mind, it should be possible, with a fair degree of accuracy, to say whether any low-temperature scheme would have a chance of being an economic success in any particular locality. It is the production cost which at all times will be the dominating factor. In my paper before the South Wales Institute of Engineers in April, 1922, I drew specific attention to this, and tried to prove that unless this figure is low, the economic success of any low-temperature distillation process is highly problematical. It will take too long to go into details of the production costs here, but it will suffice to say that the overall costs to-day per ton of raw material treated, including depreciation on capital cost (including foundations and buildings and complete plant), fuel for carbonizing, cost of handling material, power and steam, labour, and maintenance and stores, &c., should not exceed 4s. per ton, excluding briquetting if necessary. The capital cost, including everything, should not exceed 10s. to 12s. per ton of raw material dealt with per annum.

Few technical problems can rightly be said to offer more scientific difficulties than low-temperature distillation; and the sooner this elementary fact is realized the better. On the other hand, few problems have in the past been so confidently faced with such appalling ignorance. In the past, destructive distillation has been the principle; in the future constructive distillation must be the policy.

The following are the important points in regard to low-temperature carbonization:

1. From an economic point of view, the raw material must be treated in bulk.
2. Any desired reaction temperature must be easily attained and be kept with a minimum of variation.
3. Strict temperature control.
4. Rapid and uniform treatment so as to obtain a maximum throughput.
5. Lowest possible distillation temperature in order to secure the products in the primary state and avoid secondary reaction.
6. Absolute control of time duration in the various temperature zones.
7. Counter-current principle strictly adhered to, so that once an oil vapour has been evolved at a specific temperature, it should not be brought into higher temperature zones.
8. Rapid removal of distillation products once they have been formed.
9. The retort should only be called upon to act as an economical and efficient separator of solid, liquid, and gaseous products from any raw carbonaceous material, this being its primary function.
10. The treatment should aim at being continuous—continuous feeding, heating, and discharging.

Assay Plant.

It is not possible to say definitely, according to a small-scale test, how and what might be recovered on a much larger scale unless the small test or assay is carried on under the same temperature and time conditions as the commercial units. Tests where external heat is employed do not give any reliable data whatsoever for internal heating, or even for external heat application, unless the conditions outlined above are identical.

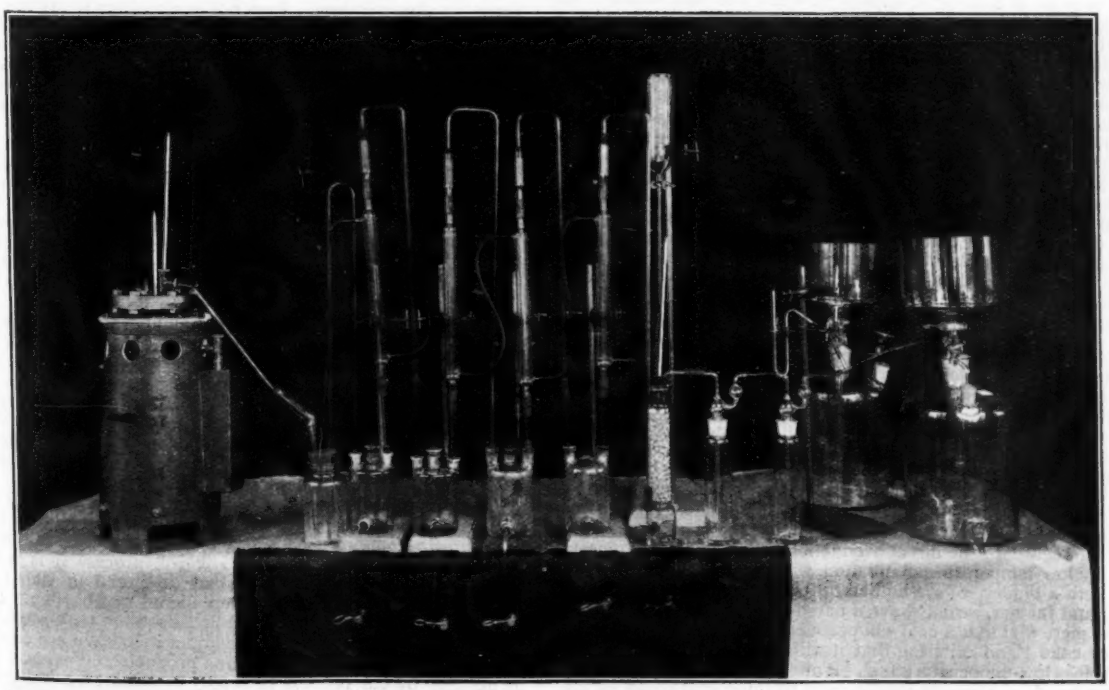
I claim to be more or less the pioneer of low-temperature distillation in rotary retorts by means of the sensible heat of an inert gas; and I found that existing assay methods did not give me any analogous result compared with large-scale operations, so I set out to make an assay plant to give comparable data. I have had a certain measure of success, and am now running assay tests in parallel with large-scale operations, and I obtain very good agreement. This assay method opens up the possibility of conveniently studying low-temperature distillation and predicting what may reasonably be expected on a large scale—in fact it acts as a laboratory control. How important an efficient laboratory control plant is, need hardly be emphasized.

These remarks have perhaps brought home to you that successful low-temperature distillation requires all the combined resources of science and engineering available in the country, and that no single man or corporation can justly lay any claims to solve this stupendous question in all its branches. All that can be claimed is that useful knowledge has been advanced a few steps.

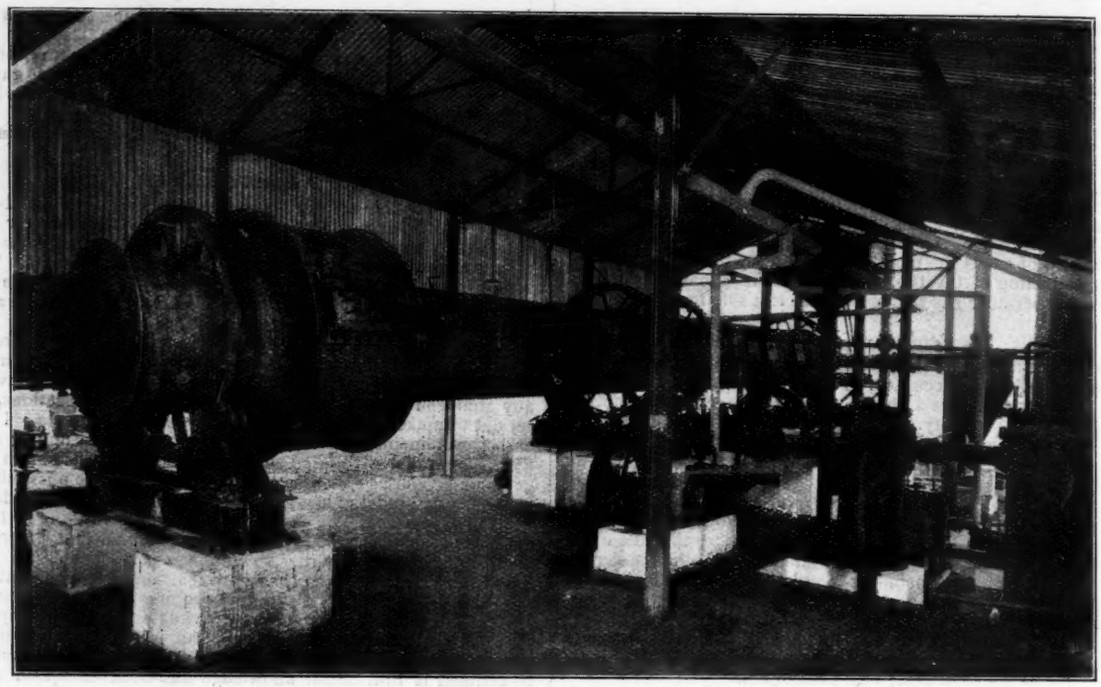
Difficulties of Distillation.

Coal and most carbonaceous materials are notoriously bad conductors of heat. For instance, at an initial temperature difference of 200° to 250° C, the penetration rate of heat is only 0·75 to 1 in. per hour; and as the heating goes on, so the temperature difference gradually decreases, with a consequent slower heat flow. A coal thickness of 4 in. requires about 5 to 6 hours before being completely carbonized. The heat flow in a given time can be materially increased by raising the temperature; but by doing this we should get beyond the low-temperature distilling range, and decompose our primary products. The only other alternative is to multiply the heating surface, or decrease the thickness of the layer of material; but when employing external heat, practical difficulties soon put a stop to expansion in these directions.

The one way still remaining is to surround the coal particle with a hot inert medium, and transfer the heat from this direct to the coal. I have done this; and I apply the heat internally without any intervening walls, and am now in a position to overcome successfully the bad heat conductivity of the coal. I have increased the heating surface of each single piece of coal. By crushing the coal to small sizes, the distance the heat has to penetrate from the outside to the centre of the various single particles can be made as short as desired. By going to extremes



THE "L. & N." ASSAY PLANT



THE ROTARY RETORT—"L. & N." PROCESS.

and grinding the material finely, the distillation can be done almost instantaneously—*i.e.*, a few seconds only will be required, or, in other words, the temperature difference need only be slight, as the distance to be traversed by the heat is very short. It will now be clear that the temperature at which the distillation is effected can be brought down to the desired extent without fear of prolonging the operations; and subsequent secondary decomposition is avoided.

My retort serves merely as a container for the carbonaceous material in bulk and the heating medium. It therefore stands to reason that the larger we make the container, the more raw material, with a proportionately larger heating surface, can be passed through, simply by increasing the volume of heating medium without altering the distilling period or the temperature range. The problem of maintaining the most suitable temperature becomes a much more simple proposition, particularly if the heating medium is generated in a separate apparatus, so that the working of the retort can be carried out independently. In this way the heating medium can be produced and adjusted without interference from the material passing through the retort.

"L & N" Process.

It may be of interest to explain how the firm with whom I am associated carry out low-temperature distillation. We employ a slowly rotating, inclined retort somewhat similar to a roasting or calcining furnace. The raw carbonaceous material is continuously fed into the top end of the retort, and travels slowly downwards towards the automatically-controlled exit, which is arranged so as to form an air lock, allowing the residue to be discharged after cooling to the outside atmosphere, but preventing the outside air from getting into the retort. The hot distilling medium enters the lower end of the retort, and travels in counter-current, and is in direct contact with the material to be treated. It raises the latter to the proper temperature very gradually and evenly, and finally escapes, carrying along with it the permanent gases and condensable matters evolved from the carbonaceous material. It naturally depends upon local conditions what kind of heating medium is employed. We claim that our distilling process is particularly applicable to a great number of projects.

Briquetting.

There is a vast amount of non-coking bituminous coal which on treatment will not form a coherent residue of suitable size for the domestic grate. Briquetting has to be resorted to; and as the so-called binder is generally pitch, it will be understood that the smoke once removed by the distillation is again added in the form of pitch, so that very little is eventually gained. There is a new smokeless binder, however, which—if the promises hold good—bids fair to develop into an industry of the greatest importance, in conjunction with an efficient distillation plant.

With regard to the direct production of a smokeless domestic fuel by low-temperature distillation, without subsequent briquetting with a binder, we are limited to the use of coking bituminous coal; and further, we only have a narrow choice within these coals, as the mere fact that a coal will produce a high-grade high-temperature coke is no criterion that it will produce a good carrying smokeless low-temperature fuel. It might be said that the surplus coking power of strongly swelling and frothing coal could be utilized for blending with slightly caking or non-coking coal, whereby a good carrying fuel would result; but it must not be lost sight of that it is very rarely the case that two such suitable coals are found in the same colliery.

There is, however, another way which is being closely investigated; and if our expectations are fulfilled, this method will be a step towards the solution of this most intricate problem. About four years ago it appeared, during a test run with our first experimental retort, that a preliminary heating and briquetting in the hot state without binder, followed by a final distillation, might produce the desired result; and I am pleased to say that experiments carried out by us, by the Fuel Research Board, and others hold out considerable promises in this direction. A smokeless uniform briquette of 2 to 4 ozs. ovoid form, made in the way roughly outlined above, is a step in the forward direction; and we have now installed the latest type of Continental briquetting plant, working according to a new and most ingenious principle, in conjunction with our retorting installation at the Old Silkstone Collieries.

Powdered Fuel.

Though the domestic chimney is justly blamed for creating most of the smoke nuisance in the London area, the industrial smoke stack in the manufacturing part of this country easily beats the domestic one. I am not in a position to say that smoke can be absolutely avoided in all cases, but manufacturers have almost to be forcibly shown how to avoid it, and thereby save money. They are in a much better position to burn coke than are householders. Modern mechanical or underfed stokers, chain grates or step grates, will burn this material, whatever the size.

Powdered fuel firing has come very much to the fore lately; and the new super-power stations in America and on the Continent are being equipped with powdered fuel appliances. Raw coal can be burnt practically without smoke in this manner. Many manufacturers would willingly consider a powdered fuel installation if all danger of explosion and spontaneous combustion could be eliminated. Bearing in mind the accidents which have happened in the past, and the risks that are still incurred owing to the highly inflammable and explosive fine coal dust, there is something to be said for their present attitude.

Powdered raw coal is a mixture of highly volatile matters in an easily oxidizable state—hence the danger. Remove these by distillation, and the carbonaceous residue will be as safe to handle as fuel oil. It is stated that a small percentage of volatile matter left in the carbonaceous residue is ample to maintain the flame propagation in the furnace. The balance of the original volatile matters is recovered as highly useful oil and gas. The latter can be used as a pilot flame for the powdered fuel furnace in cases where the distillation is done on the spot.

The possibility of erecting central distillation and pulverizing works supplying a standard grade of pulverized fuel over certain areas now becomes perfectly feasible. The powdered semi-coke is absolutely dry, as by the "L & N" process it is not subjected to water quenching, and can be stored in silos for any length of time without fear of spontaneous combustion. It does not oxidize to any extent, and can be shipped in tank wagons, and pumped and handled exactly like liquid fuel. We are convinced that, taking credit for the distillation products and gases, it should be possible by our process to supply broadcast a powdered fuel, heat unit for heat unit, at the same price as the raw coal, so that

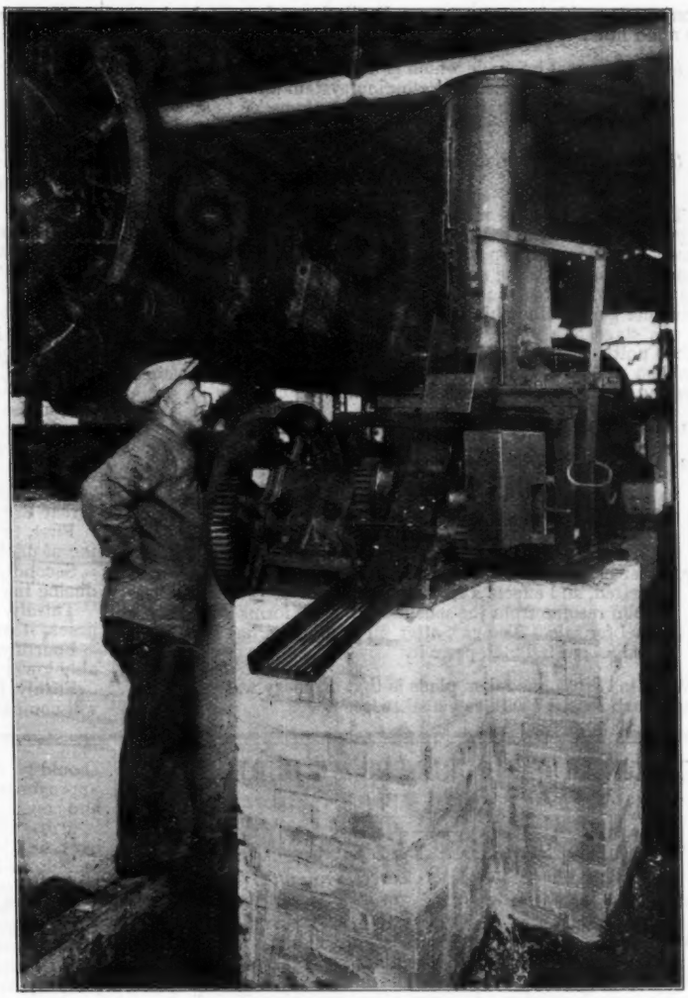
the manufacturer makes an extra profit by the increased efficiency and the labour saved in the boiler house.

GAS FOR FURNACES.

I have dealt at some length with the solid residue, as this is by far the largest percentage of the products obtained, and I shall only mention that a still further use will be found for this material. To-day's English steel prices are considerably higher than foreign prices—sometimes by as much as £2 per ton. In my opinion, though short hours and high wages play a considerable part in this, it is a fact that the cost of the fuel is by far the largest item in the cost of manufacture, and that any considerable reduction in the same will have far-reaching effects. Cheaper raw coals, once they have been treated by an efficient distillation process, are just as efficient for producer gas manufacture. The only reason why more expensive coals are used is because they work better in the producers, while cheap duff and smalls of the same heating value are useless. By distillation and hot briquetting, smalls can be made into a uniform producer fuel; and—what is still more important—the distillation gases from the retort will enrich the producer gas, so that from a ton of rough smalls and slacks about 100,000 to 110,000 c.ft. of gas will be produced of a calorific value of 180 B.Th.U. per c.ft.

When the reaction temperature of a molten-metal bath approaches the temperature of the flame employed, any higher flame temperature will effect a saving in fuel far out of proportion to the relative quantities of fuel used. An increase in flame temperature due to (say) a 5 p.ct. higher B.Th.U. value may easily effect a saving of 10 to 15 p.ct. in fuel consumed. This is a generally admitted fact. The only question has been how to obtain economically the extra 5 to 10 p.ct. in the calorific value of a suitable gas. We claim that by our distillation process it can be done; and I might here say that in this contention we have the support of some of the foremost steel people in this country and abroad.

The only way to produce cheaper steel is, first, to use cheaper fuel, but in a more highly concentrated form—*i.e.*, gas of a higher calorific value—and secondly to recover as much oil as possible by the distillation, and to take credit for this in the fuel cost. The net result will be that the British steel manufacturer will once more compete in the open market without cutting wages.

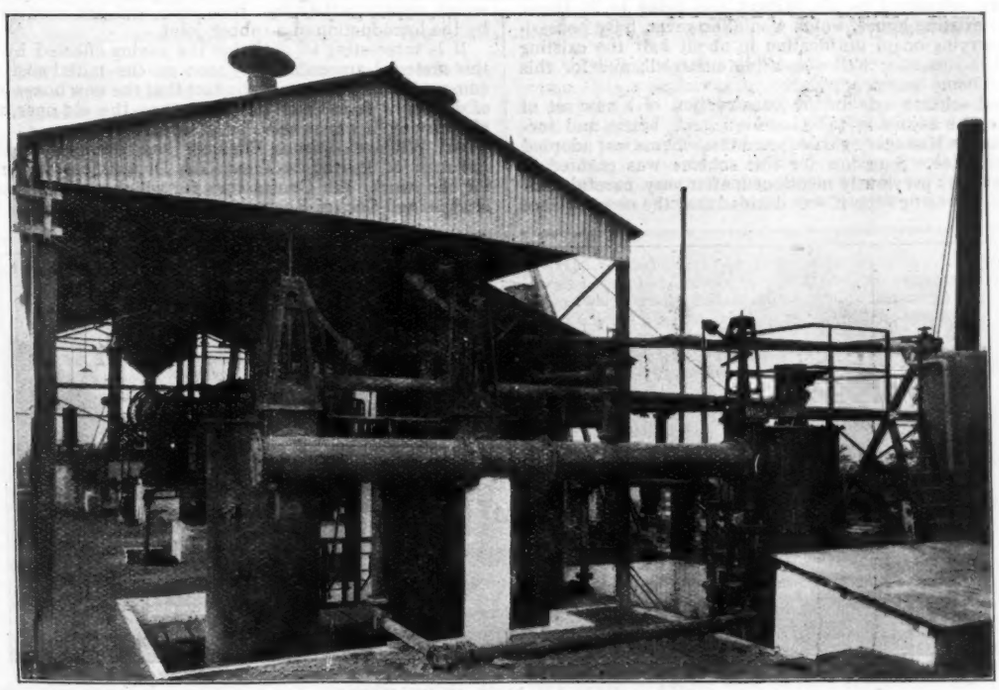


VIEW OF BRIQUETTING PLANT.

TOWN GAS.

To revert to the domestic use of fuel, town gas at present is undoubtedly the most important. The reason why town gas is perhaps not used to the extent it deserves is the comparatively high price of the B.Th.U. in gas form (about 8d. to 9d. per therm) as against the B.Th.U. in solid form (say, 1·5 to 1·6d. per therm), in both cases delivered. If the price of the gas therm can be brought down to within (say) 200 p.ct. of the solid therm, the use of gas will most certainly increase enormously. It is "only" a question of how to produce the therm for less than half the present price. In order to do this, the plant must cost less, labour must cost less, more bye-products must be recovered, and finally cheaper grades of coal must be used.

To carry this out we must turn to complete gasification in



WATER GAS PRODUCER AND REGENERATOR.

conjunction with low-temperature distillation. It must be borne in mind that:

(*a*) A gas must be made which is high enough in calorific value to allow the present distribution system and house fittings to be used, so that the necessary volume of heat will be available at any desired spot.

(*b*) For obvious economic reasons oil carburetting must be avoided.

The heating value of ordinary straight complete gasification gas is generally not more than 360 to 370 B.Th.U. This gas, though excellent for most purposes, is considered too low for efficient supply through existing mains in large towns. The lower limit may be said to be about 420 B.Th.U. By ordinary straight complete gasification this higher value gas cannot be produced in one stage in a single superimposed retort and water gas producer unit. We realized the futility of this very quickly. The problem can, however, be solved by the application of our system, working a three-stage process in the following cycle:

1. Gasification of the solid residue in water gas producers.
2. Distillation of the raw coal by superheated straight, or so-called blue, water gas, resulting in a mixed gas of 360 to 370 B.Th.U. per c.ft. The total residue from this distillation is then converted into water gas, the blow gas being used for heating the regenerators.
3. After oil absorption from the mixed gas, this is again superheated, and effects a further distillation of raw coal. The solid residue from the second distillation forms a smokeless fuel for sale. The gas, after oil scrubbing, has a value of 420 to 430 B.Th.U. per c.ft.

What in reality has taken place is that ordinary water gas has been "carburetted" with raw coal twice.

To place some figures before you, I will say that from two tons of raw coal there will be produced:

44,000 to 45,000 c.ft. of gas at 425 B.Th.U.
38 to 42 gallons of crude paraffin base oil.
0·75 to 0·78 ton of smokeless fuel.

The sale price of the gas to the consumer, when taking credit for the oils and smokeless fuel at competitive prices, will not exceed 5d. to 6d. per therm. The gas companies would be the best distributors of the smokeless fuel.

ELECTRICAL ENERGY.

In an article in the "JOURNAL" for Nov. 2, 1921, p. 368, I suggested that municipal gas undertakings should be linked up with electrical generating stations, and far more efficient use be made of the blow gas from the water gas plants. At present the avoidable waste represents about 25 to 30 p.ct. of the heat value of the water gas producer fuel. This otherwise waste heat is excellent for steam generation, and would produce from 100 to 120 KW.-H. for every ton of coal gasified. If the water gas producer is run on slightly different lines so as to make a higher-value blow gas, as I once stated, the electrical production is still more startling. I was gratified to see that Prof. Strache, of Vienna, at the World Power Conference, made exactly the same proposal.

CONCLUSIONS.

The successful distillation of the carbonaceous materials of Great Britain will lead:

First, to more employment due to the manufacture and working of distillation plants for carrying out this object.

Secondly, to more coal being mined for the purposes of producing the oils, &c., which this country requires.

Thirdly, to smokeless fuel being available for household purposes, steamships, locomotives, and factories.

Fourthly, to gas for town purposes being produced at considerably lower prices, thereby increasing the demand.

Fifthly, to electrical energy being generated at a figure which will compare favourably with electricity produced by water power.

CONCRETE GAS PURIFIERS AT BURTON-ON-TRENT.

Though reinforced concrete has been very extensively used for the construction of water tanks, reservoirs, &c., and has undoubtedly proved itself capable of being made watertight, it is not universally appreciated that this material can be made air and gas tight. The purifiers which are the subject of this article are, therefore, of more than usual interest, proving as they do that, with adequate care in the grading and mixing of the concrete, it is possible to make reinforced concrete impermeable. The decision to adopt reinforced concrete was arrived at after careful consideration of the more general factors concerned in the design of such structures.

At the official tour of inspection by the Burton Corporation Gas Committee, conducted by Mr. W. Wilson, M.B.E., the Gas Engineer, which took place on May 28, 1924, it was stated that the question of the inadequacy of the purifier system had been before the Committee on many occasions, and that in February, 1922, the Engineer was instructed to report on various schemes. Two schemes were submitted by Mr. Wilson, one being to fit larger boxes in the existing house, which would, however, have necessitated the carrying-on of purification in about half the existing purifiers while the other half was being enlarged; and for this reason this scheme was dropped.

The second scheme was for the construction of a new set of purifiers on a site adjoining the Gas Manager's house and formerly used as the Manager's garden; and this scheme was adopted by the Committee. Sanction for this scheme was granted in July, 1922, and, as previously mentioned, after very careful consideration and investigation it was decided that the new purifiers should be constructed in reinforced concrete. The structure is approximately 160 ft. long by 40 ft. wide by 6 ft. deep internal, and consists of four boxes, each 40 ft. square. The main portion of the roof consists of steel lids, of which there are four over each box, each being 15 ft. square. The remainder of the roof is, in fact, gangways round these lids in reinforced concrete, stiffened at the edges by trimmer beams projecting upwards. The gangways round the outside walls of the structure are cantilevered from the walls themselves, and those between the lid openings are supported down their centres by columns at 4 ft. centres with small cantilever beams at the top. The gangway over the dividing wall is supported by the necessary cantilever beams resting direct on the wall. Dwarf columns are provided as necessary in each of the boxes, and, together with brackets constructed in the walls, provide the necessary support for the grids. Inlets and outlets are built in, one of each in each box.

The floor under the columns is thickened in accordance with the usual practice, and filets are provided at various junctions on walls and floor. Small beams are inserted in the roof to support the crane rails on which a five-ton crane runs to lift the lids when it is necessary to inspect the boxes. These lids weigh, approximately, two tons each, and are rendered gas-tight by the introduction of a rubber joint.

It is interesting to note that the saving effected by the use of this material amounted to £2000 on the initial cost, while it is computed that, in view of the fact that the new boxes are capable of dealing with 100 p.ct. more gas than the old ones, a considerable saving in wages will also be effected.

Mr. William Wilson, Engineer and Manager to the County Borough of Burton-on-Trent Gas Department, was responsible for the work, the Contractors for which were Messrs. George Hodges and Son, of Burton-on-Trent.

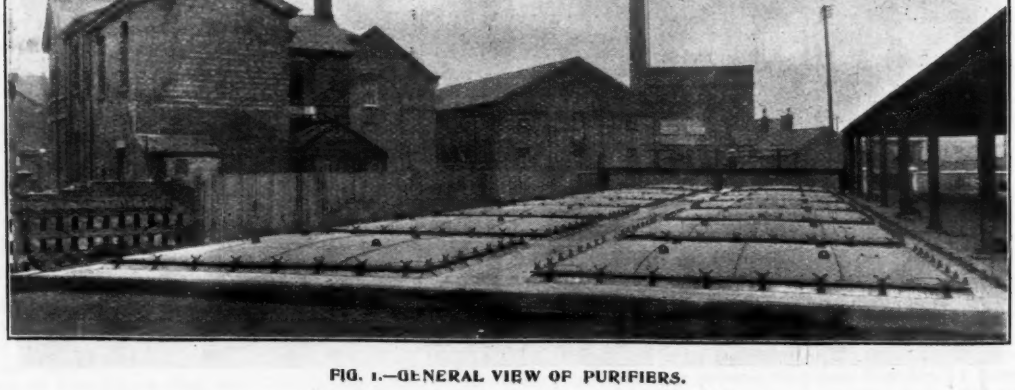


FIG. 1.—GENERAL VIEW OF PURIFIERS.

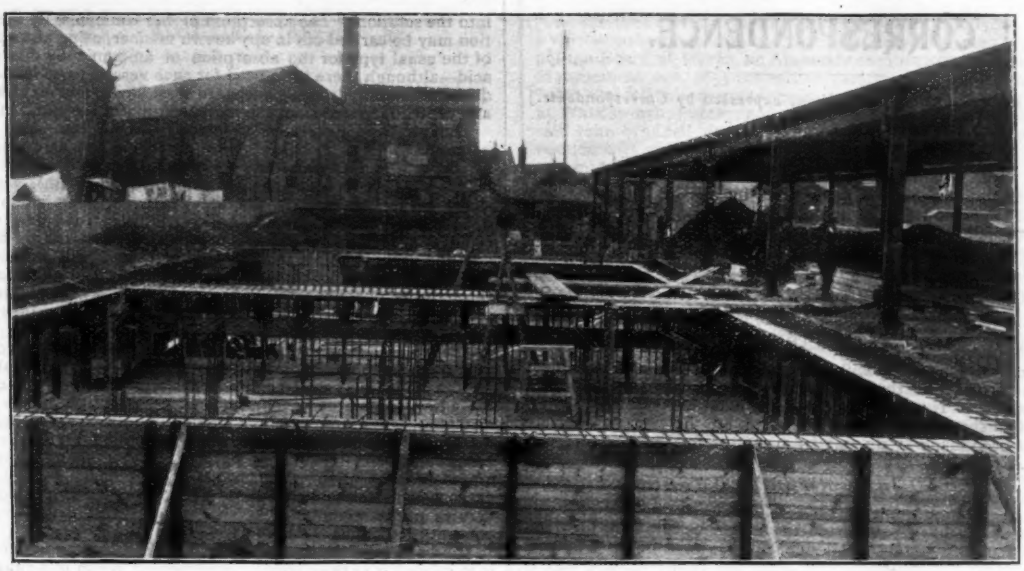


FIG. 2.—VIEW SHOWING STEEL IN POSITION FOR WALLS OF ONE-HALF OF THE BOXES.

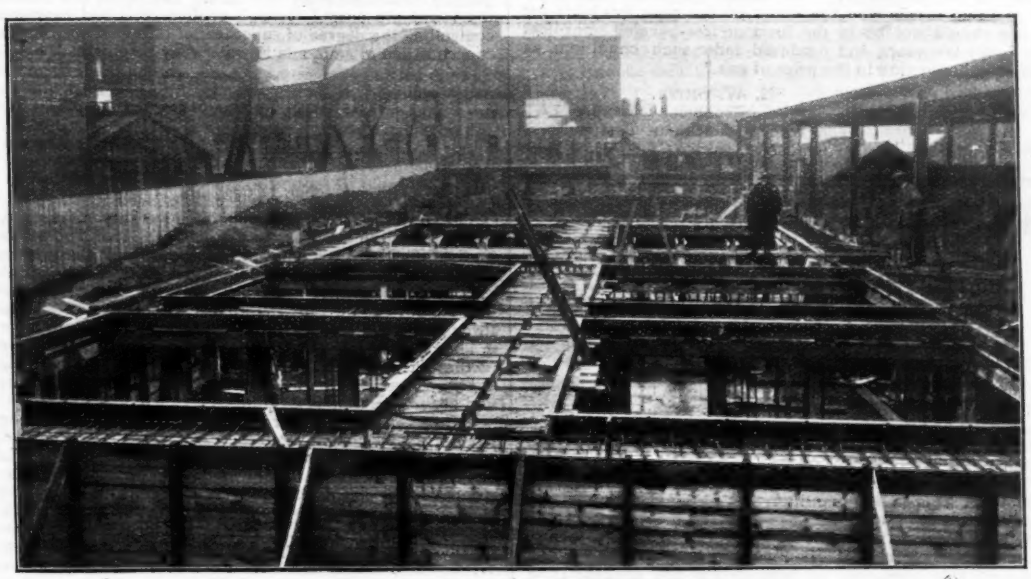


FIG. 3.—VIEW SHOWING ONE-HALF OF THE BOXES CONCRETED, AND SHUTTERING PARTLY REMOVED.

The reinforced concrete work was carried out in accordance with the designs and specifications of the Indented Bar and Concrete Engineering Co., Ltd. The oxide shed, which was roofed with Turner's "Stafford" cement asbestos tiles, was built by the Burton Constructional Engineering Company, Ltd., who also supplied the steel lids for the purifier boxes together with the holding-down channels and the bearer bars. The 24-in. cast iron valves and connections were supplied and erected by Messrs. R. & J. Dempster, Ltd., Manchester, who also supplied the Hovey crane. On completion the boxes were tested for soundness with an air pressure of 1½ lbs. per sq. in. The purifier grids were supplied by the Midland Joinery Works, Ltd., of Burton-on-Trent. A novel feature of the boxes is the 8 in. by 4-in. steel channel embedded in the concrete forming the openings for the lids. These were bracketed in the corners, and welded, and provided a very satisfactory setting for the Clapham rubber joints.

Helston Gas-Works Purchase.—The Helston Town Council, who applied for a Special Order last June to empower them to acquire the Helston Gas Light Company's undertaking, have decided to make application to the Minister of Health for sanction to borrow the entire sum required for the concern, the loan to be spread over a period of thirty years. The then Mayor (Alderman H. Toy) remarked that the Manager of the gas-works (Mr. Maclean) had informed him that a better quality of gas would be supplied, and also a larger quantity, if necessary. It was also reported that a new exhauster engine had been installed at the works.

Lighting Questions in Birmingham.—Much headway is being made in Birmingham in connection with the lighting by gas of the courts and alleys in the congested working-class districts. It is only comparatively recently that the Corporation have had the power to light these courts. The situation was, indeed, formerly Gilbertian, inasmuch as, while the Corporation might compel landlords to erect lamp-posts, they had no power to enforce the lighting. The provision of lamp-posts is now being insisted on, and the lighting is being carried out by the Corporation. Another point of interest is the revolution which is gradually being effected in the public lighting of the streets. There are now nearly 25,000 lamps in the city, and well over half of these have been converted to the clockwork system of control. A new and greatly improved low-pressure service has been undertaken in the main and secondary routes of the city, and will shortly be extended to communication roads.

Gas Wash-Boilers on Instalment System.—The Middlesbrough Corporation have decided to purchase as an experiment a hundred gas heated wash-boilers and to fix them for slot-meter consumers in St. Hilda's Ward who are prepared to pay for the boilers by weekly instalments of 6d. over a period of three years. The Gas Manager (Mr. C. F. Blincoe), in a report on the subject, says that a canvass has been made of the slot-meter consumers in the ward. The number interviewed was 1700, but only 153 were prepared to purchase the boilers. A considerable proportion, however, occupied single rooms, in which cases it was considered undesirable to fix the boilers.

Leeds and the Smoke Trouble.—Mr. C. S. Shapley, General Manager and Engineer to the Leeds Corporation Gas Department, was the speaker at a Leeds Luncheon Club on Nov. 6, and dealt with the manner in which gas can be utilized to eliminate the smoke nuisance of great cities and towns. Mr. Shapley said the vertical retort house at the Meadow Lane Gas-Works was the highest building in Leeds, and on many a Sunday morning he had been to the top to view the vast clouds of smoke rising from domestic chimneys, at a time when there was little coming from the factories. The population were not yet fully educated up to the benefits of gas cookers and gas heating. He reviewed briefly the history of the Leeds gas undertaking, and mentioned the great improvement in recent years in the make of gas per ton of coal carbonized. The make was 10,993 c.ft. per ton in 1912, which compared with 13,189 c.ft. in 1923, and 14,319 c.ft. for 1924. Probably the figure would be 15,000 c.ft. for the current year.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Low-Temperature Strategy.

SIR,—I wish, without comment, to place before you and your readers a quotation which is being used by one of the many companies that are exploiting the process of low-temperature carbonization. Immediately after the paragraph that has been quoted you will find the remainder of the paragraph which followed, but which was not quoted. This is self-explanatory and quite sufficient.

"EXTRACT FROM PAPER READ BY E. W. SMITH, D.Sc., F.I.C., Director of Woodall-Duckham Companies, on 'THE CO-ORDINATION OF FUEL SUPPLIES.'"

"The price of electricity will have to be very materially reduced before it is anything but the luxury of the fortunate few—for general heating purposes. It is essential, therefore, that a cheap free-burning smokeless fuel should be developed and put on the market. Serious efforts have been made to do this by means of low-temperature carbonization."

FROM WORLD POWER CONFERENCE TRANSACTIONS.

Paper No. 22. p. 9.

"Serious efforts have been made to do this by means of low-temperature carbonization. So far all such methods have met with failure. The processes are not self-supporting when the resultant solid fuel is sold at an attractive price. If success is to be attained in the production of a satisfactory smokeless fuel, it can only come through the instrumentality of the gas industry, and high-temperature carbonization. There is no reason why the whole of the coke available for domestic sale should not be in the form of free-burning smokeless fuel within a very few years, and produced under such conditions as to effect an actual reduction in the price of gas."

E. W. SMITH,
Technical Director,
The Woodall-Duckham Companies.

52, *Grosvenor Gardens, London, S.W., Nov.* 10, 1924.

REGISTER OF PATENTS.

Ammonia Recovery.—No. 222,587.

BONE, W. A., of St. Albans, and FINCH, G. I., of Gainsborough Mansion, W. 14.

No. 17,681; July 7, 1923.

This invention relates to the separation of ammonia from gases containing it by means of phosphoric acid.

The patentees have found that a solution of phosphoric acid absorbs ammonia from gases with a rapidity approximately equal to that with which ammonia is absorbed by sulphuric acid of equivalent strength. Below 50° C. an aqueous solution of phosphoric acid of 1 p.ct. strength absorbs ammonia from gases quantitatively; at 60° C., the escaping gases at normal pressure contain ammonia corresponding with a partial pressure of 0·2 mm.; at 70° C., 0·41 mm.; and at 80° C., 1·2 mm. The compound chiefly formed is di-ammonium-hydrogen-phosphate, which under suitable conditions of temperature and concentration crystallizes from the liquor, which may contain di-ammonium-hydrogen-phosphate in solution and also in certain cases mono-ammonium-dihydrogen-phosphate or mono-ammonium-dihydrogen-phosphate and phosphoric acid. When the di-ammonium-hydrogen-phosphate thus produced is heated, either under atmospheric or reduced pressure, to a temperature which need not exceed 170° C., and may be less, it yields up its ammonia until neither mono-ammonium-dihydrogen phosphate or phosphoric acid, or a mixture of both, is left, according to the conditions of temperature and pressure, and time occupied in heating. In either case the residue when re-dissolved in water is capable of again absorbing ammonia.

It follows from these observations that a saturator charged with phosphoric acid may be operated on lines similar to those on which a saturator is operated when charged with sulphuric acid. That is to say, a crystalline salt, substantially di-ammonium-hydrogen-phosphate, can be removed from the saturator and phosphoric acid or mono-ammonium-dihydrogen-phosphate may be added to the liquid to keep it at substantially constant acid strength, just as the liquor of the ammonium sulphate saturator is kept at constant acid strength by addition of sulphuric acid, but with this advantage—that the necessary acid (allowing for unavoidable loss) may be derived from the crystals which have been removed, by the operation which recovers the ammonia, namely by heating them.

These facts are applied to the recovery of ammonia from coal gas, coke-oven gas, producer gas, or the like, with the object of avoiding the importation of sulphuric acid into the works for absorbing the ammonia and its subsequent export in the form of ammonium sulphate or, if the ammonia has been liberated from it, in the form of some other sulphate.

According to one method of carrying out the invention, the gases containing ammonia, or the ammoniacal vapours from a still, having been previously freed from any tar they may contain, and cooled preferably to a temperature of 50° C. or below, are passed through a solution of phosphoric acid or acid ammonium phosphate containing the equivalent of about 1 p.ct. of free acid. This particular strength, although well suited to the purpose, is not essential. Di-ammonium-hydrogen-phosphate is formed and crystallizes from the solution while an equivalent amount of acid in the form of phosphoric acid or mono-ammonium-dihydrogen-phosphate or a mixture of them is reintroduced into the solution. The absorption of the ammonia by the acid solution may be carried out in any known manner, using absorption vessels of the usual type for the absorption of ammonia by dilute sulphuric acid—although there is no need for such vessels to be lead-lined. The di-ammonium-hydrogen-phosphate crystallizes, and may be withdrawn and centrifuged free from the mother liquid in the usual manner.

Though it is generally preferred to cool the gases containing ammonia to 50° C. or below before absorbing the ammonia by means of the acid bath (a procedure which would be in conformity with the usual gas-works practice using a sulphuric acid bath), yet in certain cases (as, for example, in the direct recovery of ammonia from coke-oven gases, which are usually not cooled below their dew point before removal of tar and ammonia from them) it would not be advisable to cool the gases to below their dew point (which will usually be above 50°, and may be as high as 70° C.) before passing them (tar-free) through the phosphoric acid bath. In such a case dilute sulphuric acid solution would be used for removing the small quantity of ammonia escaping absorption.

The solid di-ammonium-hydrogen-phosphate produced is subsequently decomposed by heating to a temperature of (preferably) 170° C. in a suitable iron vessel at atmospheric pressure, or to a correspondingly low temperature under reduced pressure. It is thus dissociated into phosphoric acid or mono-ammonium dihydrogen-phosphate and ammonia. The phosphoric acid or mono-ammonium-dihydrogen-phosphate remains in the iron vessel and is subsequently returned to the ammonia absorption vessel, while the ammonia is evolved in the gaseous condition and can either be cooled and compressed into cylinders as pure ammonia, or be absorbed in water for the production of concentrated aqueous ammonia.

Another way of decomposing the di-ammonium-hydrogen-phosphate is to subject it to the action of superheated steam in a suitable vessel, the degree of superheat being so regulated that the ammonia driven off forms a concentrated solution of the ammonia with the water subsequently condensed from the steam. The steam and ammonia leaving the vessel are passed through cooling coils and condensed: and by controlling the degree of superheat of the steam any desired degree of concentration of ammonia in water may be obtained.

Washing Coke, &c.—No. 222,618.

JENNINGS, A. L., of Cleckheaton.

No. 20,519; Aug. 13, 1923.

No. 11,646; May 12, 1924.

This invention relates to apparatus working on the specific-gravity principle for the washing of coke, pan-ash, &c. The patentee remarks on the difficulty, experienced in such plant, of pieces of coke of high specific gravity sinking in the liquid and being lost; and the object of the invention is to prevent these heavier pieces from falling to the bottom, but should they fall, to cause them to rise and to pass away through the washed coke discharger.

The two provisional and the complete specification cover ten pages of the official form, and there are eight sheets containing 13 closely figured drawings. To these, readers are referred. The general description of the invention is as follows:

There is an outer tank or chamber, within which is arranged an inner circular compartment preferably—though not necessarily—out of centre. The wall of this compartment is made parallel for a portion of its depth, and then tapers inwards as it approaches a central restricted opening at the bottom. It is fixed in position by any suitable means, such as stays, for securing it to the outer tank, which may either be provided with vertical parallel walls for the whole of its depth, or they may be made partly parallel and then arranged to taper inwards. Within the chamber and carried in suitable bearings is a vertical shaft receiving motion from any suitable source of power. On the shaft is fixed or adjustably mounted a propeller for causing the water in the chamber to form a vortex therein, whereby the heavier particles of fuel are caused to rise and to pass out over a chute after being washed, while the dross falls through the restricted opening in the bottom of the chamber. The dross is removed from the outer tank by means of the buckets of an elevator working over pulleys fixed to suitable framework either connected with, or arranged at a distance from, the washing apparatus.

Valves for Meters.—No. 222,775.

SMITH, E. W., and SMITH METERS, LTD., both of Kennington Park Road, S.E 11.

No. 9171; April 10, 1924.

This specification covers a detail in the construction of (particularly) a prepayment gas meter.

The patentees claim: In a valve member, for use in connection with meters having prepaid or coin-freed mechanism in which the valve member or cover is adapted to open and close the gas inlet, the provision of a securing ring of angular cross-section and with bendable arms for securing a leather or equivalent washer over the face of the valve member by gripping the washer on the outer part of its flat face as well as over its outer edge; the bendable arms engaging over the outer edge of the valve member. The ring is of slightly tapered or inclined shape.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 5.]

Nos. 25,472 to 26,102.

CAMPANY, A.—"Gas cooking-ovens." No. 25,848.
KOPPERS COMPANY.—"Coking retort ovens." No. 25,794.
MITCHELL, G. P.—"Heating of gas boilers." No. 25,850.
POULSON, J.—"Gas burners." No. 25,722.
WILSON, G. G.—"Coke-quenching machines." No. 25,947.

LEGAL INTELLIGENCE.

WANDSWORTH GAS COMPANY v. LONDON COUNTY COUNCIL.

Broken Gas Main in St. John's Road, Putney.

Judgment has been delivered by HIS HONOUR JUDGE BAIRSTOW, in this case, the first day's hearing of which took place at the Wandsworth County Court on May 1 last, and was reported in our issue for May 14, p. 473.

The Wandsworth Gas Company claimed from the London County Council the cost of diverting a broken gas main in St. John's Road, Putney—alleging that the breakage, which took place in 1923, occurred owing to the negligent manner in which the brickwork of a sewer manhole had been constructed by or on behalf of the Metropolitan Board of Works in or about the year 1882.

Mr. FOX ANDREWS (instructed by Messrs. Sloper, Potter, and Goschen) appeared for the plaintiffs, and Mr. LANCELOT FLETCHER (instructed by the Solicitor for the London County Council) for the defendants.

In addition to the evidence given by Mr. Cyril Murton Croft, the Chief Engineer of the Wandsworth, Wimbledon, and Epsom District Gas Company, on behalf of the plaintiffs, as reported in the "JOURNAL" for May 14—the following evidence was called for the plaintiffs.

Mr. *H. J. Dean*, M.Inst.C.E., M.I.Mech.E., said he was a Consulting Engineer of 25 years' experience in public works. He had tested the piece of gas main left in the brickwork, and had found the same in excellent condition. There was no indication that damage had occurred to the gas main through deterioration of the main itself. The pipe was built solid into the brickwork, and mortar placed between brickwork and pipe on both sides so as to form an absolutely tight connection round the outside of the pipe. No allowance had been made for movement in the pipe. In the opinion of the witness, this was a bad piece of engineering both at the time when the work was carried out and at the present day. An engineer forty years ago had the same opportunity as the engineer of to-day of knowing that a pipeline of gas main was liable to movement. The increase in motor traffic made no difference to gas mains if they were laid at a proper depth and had a proper bearing. The pipe gave way because the metal was stretched beyond its limit, either by a definite load on one end or by vibrating the pipe up and down. In cross-examination, witness said that, when a gas pipe cracked, a leakage would occur at once. He should expect it to crack, and the entire fracture to follow. In regard to vibration set up by traffic, the factors to be taken into account were the weight and speed of the vehicle, and the state of the road. He agreed that anyone at the site would have an opportunity of seeing that the pipe was encased in the brickwork. The real point was the question of the settlement of ground, which dated back to time immemorial.

Mr. *E. B. Taylor*, M.Inst.C.E., M.I.Mech.E., said he had fifty years experience, and was Consulting Engineer to a large number of water companies and authorities in the country. He agreed in substance with the evidence of Mr. Dean. Subsidence due to the fact that earth had been freshly disturbed and replaced would commence at once, and would very likely continue for forty years. They could never replace earth when it had once been moved, and get it into the same position as nature had put it. The joint between a pipe was a flexible link, and gave a little ease in movement. It was due to the series of joints in a main laid in the ground that a main did not break. In the situation in question in this case, no competent engineer forty years ago would hold gas mains rigidly in brickwork. The proper practice would have been to divert the gas main. Vibration was different now from that of forty years ago, but not more excessive. At that time the traffic was lighter and there was less of it; but at present most of the wheels were pneumatic, and the surfaces of the roads superior. A pipe four or five feet below the surface would be immune from vibration. Witness thought it was much more likely in the present case that there had been settlement rather than vibration.

The following evidence was called for the defendants.

Mr. *T. W. A. Hayward*, M.Inst.C.E., F.S.I., said he had had large experience in engineering work involving the laying of underground mains. In his experience he had seen scores of examples similar to the present one. Witness produced plans and gave instances of other specific works which had been carried out years ago in a similar manner to that in the present case. He said that in 1882, in the small towns, there were not qualified engineers. The traffic then was totally different. He would not build a cast-iron pipe solid in the brickwork to-day, because later experience had shown that the pipe should not be built-in rigidly. It would have been better for the brickwork to have been arched and packed. It would also have been better if the person responsible for the work had required the gas main to be diverted.

Mr. *J. P. Harris*, M.Inst.C.E., a District Engineer under the Chief Engineer of the London County Council, stated that the work would not be done now as it was done in 1882 or thereabouts. He produced a list of many instances where pipes were held in brickwork as in the present case. His theories as to the cause of the cracking of the pipe in the present case were vibration, traffic, and settlement. So far as he could judge it might be any of them. Much would depend upon whether the ground underneath the pipe, where it left the brickwork, was consolidated sufficiently well.

Mr. *N. Storgie*, M.Inst.C.E., Borough Surveyor and Engineer for Hackney, said that forty years ago it was the common practice to lay pipes in brickwork as in the present case. If a pipe was in the way, they built the brickwork round it. At Hackney they had found many instances where the pipes had been built rigidly into the brickwork, and they were existing to-day. If he had had to do this work in 1882, he would have done it in the way in which it was actually done. In his opinion nothing but vibration or settlement could have caused the fracture. Settlement alone would not cause the fracture, but traffic going over the surface, with the unstable ground beneath, would tend to break the pipe.

At the Westminster County Court on Oct. 17, HIS HONOUR delivered a written judgment. He said that in or about the year 1882, the Metropolitan Board of Works, an Authority constituted under the Metropolis Management Act, 1855 (19 and 20 Vict., c. 120), made a contract with John Waddell to construct certain sewers and incidental works for them at Wandsworth, Putney, and elsewhere in the County of Surrey. The said John Waddell, under this contract, constructed a manhole in connection with the sewer in St. John's Road, Putney. In constructing this manhole he interfered with a gas main, the property of the plaintiffs, by removing the earth which supported it, and to an extent indicated on the plan produced and marked N.J.D.1, substituting in part for that support a brick wall portion of the manhole shaft, so as rigidly to enclose the said main by brickwork at two places along its line. In October, 1923, a leak was discovered in the main at one of the places where it was so rigidly enclosed. The pipe had been broken. The breakage was caused by vibration due to traffic or by subsidence of the pipeline or by both causes operating together; and it was the result of this rigid enclosure. The defendants, to prevent the recurrence of a similar breakage, diverted the pipe, and the cost of the diversion was £19 1s. 11d. The plaintiffs claimed this sum, and £1 in addition for damage from the defendants, and the defendants, if liable, agreed that £20 1s. 11d. was the amount they ought to pay. The defendants were sued as the transferees of the liabilities of the Metropolitan Board of Works by virtue of the Local Government Act, 1888, s. 40, s.s. 8, and it was conceded that if the Metropolitan Board of Works were originally liable, the action was properly brought against the defendants.

The substantial question of fact for determination was whether Waddell was negligent in constructing the manhole as he did. The evidence was the evidence of experts. His Honour had come to the conclusion that as gas mains were from their situation liable to vibration or movement, it was bad work to-day, and was bad work in 1882, to brick or concrete them in, so that they could not vibrate or move. The defendants' experts had endeavoured to persuade His Honour that, though bad to-day, it was not bad in 1882. Mr. Hayward had attempted to support this contention on the ground that the case in question was not an isolated one, and His Honour was satisfied that other similar cases might be found. Taking the whole of the evidence, His Honour said he was satisfied that Waddell was negligent in the way in which he carried out this work. As a consequence, the pipe broke. The fracture was not due to any vibration or movement that ought not to have been anticipated. There remained the further question as to the result in law of this finding. The Metropolitan Board of Works were justified in contracting for the execution of the work which it was their duty to do, but they did not by so doing discharge their duty, which involved the exercise of reasonable care in relation to gas mains, &c., with which there might be interference in the execution of the work. Judgment was given for the plaintiffs for £20 1s. 11d. and costs.

GAS MANAGER'S SUIT FOR LIBEL.

At the Devonshire Assizes on Friday last, before Mr. JUSTICE GREER, an action was heard in which Mr. Harold Higham, Gas Manager in the employ of the Teignmouth Urban Council, claimed damages against Mr. Frank Herbert Bigg-Wither, of Teignmouth, Secretary of the National Citizens' Union, for an alleged libel contained in a letter by defendant in the "Teignmouth Gazette" and the "Teignmouth Post" in April last.

Mr. PERCIVAL CLARKE appeared for the plaintiff, instructed by Messrs. Tozer and Dell; and Mr. H. S. EMANUEL, K.C., and Mr. E. P. C. WETHERED for the defendant, instructed by Messrs. Houlditch, Anstey, and Thompson.

Mr. CLARKE asked for the protection of the Court against these constant assaults upon his client's reputation and character, and he claimed from his assailant such damages as would deter him from pursuing the wrongful course he was pursuing and had been pursuing ever since the Manager's appointment to the office. The plaintiff had been a student of Manchester University. He was second in England in the gas examination of the City and Guilds of London Institute; up to 1904 he was Assistant Manager of the Stockport Gas-Works; in 1904 he became Assistant Manager of the Bradford Corporation Gas-Works; in 1917 he became Gas Engineer and Manager of the Shipley Urban Council; he was a member of the Southern Association of Gas Engineers and Managers, and a Fellow of the Chemical Society; he was appointed Manager of the Teignmouth Council Gas-Works in October, 1918, being chosen from 80 candidates for the post. On appointment he suggested several alterations, and his report was submitted to a consulting engineer, who supported his view. The suggestion for having vertical retorts, at a cost of £20,000, was not adopted; but the Council at his suggestion took up water gas, in the interest of economy, during the year 1920. The demand for it was increasing every year. The defendant criticized the gas undertaking adversely; and in a letter dated April 6 he wrote: "The real cause of our troubles is that the Council will not take outside expert advice; and though the Gas Manager may perform his work as such in a most efficient manner (I am not expressing any opinion on this), there can be no doubt that he is not qualified to act as Consulting Gas Engineer for the works he is in charge of."

Counsel said this was the culminating letter in a series of constant attacks on the Gas Manager by the defendant, who not only found fault with and condemned the Manager, but abused the whole staff of the gas undertaking. He also made complaints of the Board of Trade, and probably censured the President of the Board of Trade. He was a self-appointed censor, a local busybody, who took up such local questions as the gas supply in order to minister to his own self-importance by attacking local officials. It was not fair criticism of a local administration with regard to a public department, written in the interest of the ratepayers and for the good of the town. It was a personal attack, and not fair comment at all. The Manager was a gentleman of the highest professional capacity, who came to Teignmouth with the highest credentials, having occupied similar posts elsewhere, one of them being in the large town of Stockport. He complained, and

had reason to complain, of these repeated libels by the defendant, who called himself an inhabitant of an "official-ridden country," and who had, apparently, determined to hound the Gas Manager out of the town. In consequence of the frequent letters of the defendant to the Council and to the Press, the reputation of the plaintiff as Gas Manager was likely to suffer damage, so far as the letters had any weight with the public.

Mr. EMANUEL cross-examined the plaintiff with a view to show that the whole letter was fair comment upon a subject regarded from the viewpoint of a disappointed and dissatisfied ratepayer. The witness's replies were to the effect that the facts cited in the letter were untrue, that the opinions expressed were prejudicial to him as Gas Manager, and that the entire letter was an attempt to disparage him and reflect upon his professional reputation. He had demanded from the defendant £100 damages and a public apology, failing which a writ would be served. These overtures had been rejected, and the present action had been commenced.

Letters were put-in which had been written by the defendant to the Urban Council, the Director of Gas Administration, the Board of Trade, and the President of the Board, with a view to show from such correspondence that the defendant had an animus against the plaintiff, and sought to disparage him in his office as Gas Manager.

Mr. EMANUEL said that the defendant was only making fair comment on a matter of public interest in which he was interested. In other words, he was attacking policies and not individuals. He submitted there was no case to answer.

His LORDSHIP ruled that the case must go to the jury. It might be that the words complained of did not directly affect the plaintiff; but the point was the inference to be drawn from the words, and it was better that the jury should consider this point.

Mr. *Bigg-Wither* said he was an electrical engineer, and acted as Secretary to the National Citizens' Union—a local body formed to watch over and protect the interests of ratepayers. He never intended to attack Mr. Higham personally, and had no feeling against him personally. In his letters he had merely criticized the Council's policy.

Further letters were read which defendant had written on the subject.

His LORDSHIP said he saw no evidence of spite in the letters.

COUNSEL, after this intimation, said he would not deal further with the voluminous correspondence in the case.

His LORDSHIP asked the jury to say whether the letter complained of as libellous alleged mismanagement or incompetence on the part of the plaintiff. It would be a sad day for this country if persons appointed by the ratepayers were to be too sensitive to public criticism. Everybody who read this letter knew that the plaintiff was the Gas Manager, and in a large measure, though not entirely, responsible for the management of the undertaking. How did the jury interpret the letter? Other letters that had been admitted in the case showed that, to say the least, the defendant had no great admiration for the plaintiff. The vital paragraph in the report, taken in its literal sense, was not an attack upon the Manager's competency, but a reflection upon him for want of knowledge. But how would an ordinary reader regard it? Taking the letter fairly from beginning to end, if the jury thought it was an attack upon the competency of this man, then it was not justified, and he was entitled to damages. If they so found, the jury should consider the defendant's offer to express his regret in the newspapers and to disclaim any reflection upon the plaintiff's ability. His Lordship regretted that the plaintiff did not see his way to accept that solution of the trouble. The jury should not consider a large amount as damages, yet not so small as to be regarded as contemptuous.

The jury, after half-an-hour's deliberation, found a verdict for the plaintiff, and damages of ½d.

On this, the Judge directed the costs to follow the event.

Belfast Gasholder Litigation.

Further litigation as a sequel to the erection of the gasholder at the Belfast Gas-Works was mentioned in the Court of Appeal, Belfast, on Friday. The parties were the executors of the late Mr. John Graham, of Dromore, Contractor, who erected the holder, and the Belfast Corporation. The executors of Mr. Graham appealed from an Order made by Mr. Justice Brown that all proceedings in the case should be stayed, and that the matters in dispute between the parties be referred to the arbitration of the President of the Institution of Gas Engineers and the President of the Society of British Gas Industries, or such person or persons as they might appoint. Plaintiffs' claim was for £24,378 due under a contract between the late Mr. Graham and the Corporation for the erection of the holder tank, and for damages for breach of warranty or drawings supplied to the plaintiffs by defendants. The case was adjourned pending a settlement to be approved of by the Belfast Corporation.

York Town and Blackwater Gas Company.—The tenders for the £10,000 5½ p.ct. perpetual debenture stock, and £10,000 additional share capital, which Messrs. A. & W. Richards, No. 37, Walbrook, offered on behalf of the Directors of this Company, were opened on Nov. 6. The issue was more than twice subscribed; the tenders for the debenture stock ranging from £110 down to the minimum of par, and for the ordinary shares from £13 5s. down to the minimum of £12 per share.

The Lecture Season.—Messrs. E. Bennis & Co., Ltd., have a large number of lantern slides dealing with mechanical stokers and mechanical coal and ash handling plant, which they will be pleased to loan to societies, institutions, and individuals for lecture purposes. Particulars of these are given in a printed booklet which will be sent post free to "JOURNAL" readers. When requesting slides, it will be sufficient to give the number of slides and the date when they will be required. Applications should be made as far in advance of the lecture date as possible, and should be addressed to Messrs. E. Bennis & Co., Ltd., No. 28, Victoria Street, London, or Little Hulton, Bolton.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There has appeared in the "London Gazette" the following further notice regarding applications to the Board of Trade under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC VALUE.

Oakham Gas and Electricity Company, Ltd.—500 B.Th.U. (Dec. 22.)

BECKTON.

We are pleased to see in the November issue of the "Co-Partners Magazine" of the Gas Light and Coke Company the following reflections on the world-famed gas station at Beckton:

Uncouth and grim the workshop and the shed
Loom through the dark, as monsters in the mire
Of their primæval marsh; the flickering fire
Within their lidless eyes, from glowing red,
Resurgent leaps to white flame overhead;
And spiral smoke, thin as the sigh of death,
Stains the still air, clouding with baleful breath
The first pale star above the river bed.

The works are silent: slowly moves the night
Up jewelled ways to shadowy steeps of blue,
With the same tenderness as where her shoe
Treads the quiet hollows of the lonely height,
Calling man's spirit to take wing anew
And travel with her spaces infinite.

OLGA MILNE WATSON.

SPENBOROUGH GAS DEPARTMENT FINANCES.

The Chairman of the Gas Committee (Mr. J. H. Collier) presented to the Spenborough Urban District Council at a recent meeting a statement on the working of the Gas Department for the year ended March 31 last. The gas consumed amounted to 286,093,600 c.ft., an increase of 11,000,000 c.ft. This, he said, having regard to the present state of trade, must be considered reasonably satisfactory. To enable them to sell this quantity, 21,697 tons of coal had been carbonized. As to residuals, there had been a better market for coke, for which they had received 2s. 6d. per ton more. The yield of tar was rather better, and the price approximately the same. The market for liquor had, however, been very disappointing. The works had been maintained in a satisfactory state of repair; and though the Committee put aside some years ago the sum of £4000 for the renewal of the vertical retorts, they had not yet drawn upon it. It would be remembered that in October last the Committee reduced the price of gas, and though they had sold more in the period under review the revenue was slightly less. Loan charges were lower. When the money was borrowed for the purchase of the Heckmondwike and Gomersal Gas-Works, the rate of interest was high; but as these loans had been paid off, the Committee had been able to reborrow at a lower rate of interest. Sinking fund charges generally had been reduced by an extension of the period of repayment from twenty to thirty years having been sanctioned. The total net profit was £2662, against £119 the previous year.

It had been hoped that the Committee would have been able to make a further reduction in the price, but they were not able to do this at present because they had several items of large expenditure facing them. The repair of the holder at Cleckheaton would have to be undertaken. He concluded with a tribute to the work done by the Engineer (Mr. Arthur L. Jennings) and his staff.

The Chairman of the Council thought their best thanks were due to Mr. Collier and the Engineer for the excellent result of the year's working.

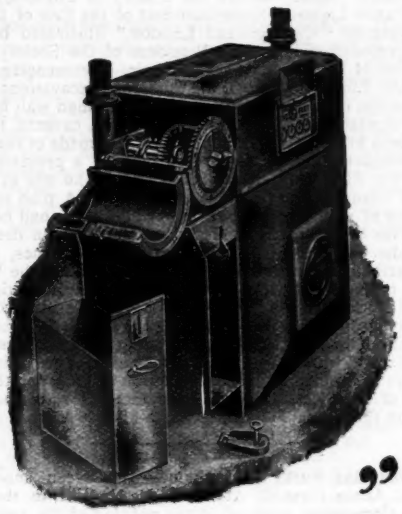
TRADE NOTES.

Chain-Grate Stokers.

Messrs. Ed. Bennis & Co., Ltd., have forwarded their new catalogue describing the Bennis patent chain-grate. This new issue contains much data and many illustrations. Copies will be sent post free to any reader of the "JOURNAL," on application to the firm at No. 28, Victoria Street, Westminster, S.W. 1.

Elstree Gas Company's Assessment Reduced.—Mr. E. Howard Collins has been successful in obtaining a big reduction in the assessment, which has been recently settled, of the Elstree and Boreham Wood Gas Company's undertaking. Under the revaluation, the new figures were £2828 gross and £1367 rateable; but the valuers have agreed to reduce them to £1600 gross and £600 rateable, and to this the Committee have assented.

Conway Gas Affairs.—At a meeting of the Conway Town Council recently, Mr. Price F. White gave a summary of a joint report between himself and the Gas Manager respecting the gas-works in relation to the present conditions of working, and giving their comments on the general position of the undertaking. In view of the importance of this report and the suggestions made that an expert be consulted to advise the Committee further, the Gas Committee resolved that a further consultation should take place between Mr. Price F. White, Mr. H. Dixon, and Mr. F. A. Delamotte, and that the matter should then be further considered by the Gas Committee.



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NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

On improved world-trade hopes, the coal trade has taken a brighter outlook during the week. There has been more inquiry from the Continent, including Germany, without, however, much actual business maturing so far. The chief hope for the coal trade must be first of all in improved home trade and more demand from home industries, and, in the better prospects of the iron and steel trades, this would seem not unlikely to be forthcoming in the near future. But it is quite realized that, with so many collieries closed or working short time at present, a good deal more coal will become available before any substantial increase in prices takes place.

Inquiry has been mostly for the better classes of coal, and this has been particularly noticeable in the gas section, where specials and bests have been firm, while seconds have weakened. Nominal quotations for Wear Specials were 21s. 6d. to 22s. f.o.b., best qualities 20s. 6d. to 21s., and others 17s. 3d. to 18s. Business has been put through in some of these as low as 17s. or perhaps even a few pence less for certain positions.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Gas coal is being offered greatly in excess of current requirements; and with storage capacity already stretched to the uttermost, the low prices named receive little attention. Consumption is increasing only very slowly. Prospects of an expanding demand for industrial purposes are considered more hopeful; but at present the market is very sluggish. So far as household coals are concerned there is some little quickening of alertness. The actual volume of trade is still depleted by the earlier buying, and though there is a rather better inquiry for medium grades, values are weak. This has made stocking a good proposition, not only for collieries but for distributors. Curtailment of production has been necessary, however, very few pits now making full time. With improving sales of pig iron and stiffening prices a stronger feeling has manifested itself in regard to furnace cokes. Thus far the actual recovery of values does not amount to much. Big buyers have been able to make purchases on terms very nearly as favourable as those which prevailed a month ago when the market was at the ebb. Chance business has been placed at somewhat higher rates, but within the scale applying to sales with the contract clause as to moisture content, 16s. 9d. for a 20 p.ct. maximum.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coal in the open market in Yorkshire and Lancashire is moving very slowly, the majority of consumers finding it difficult to take out their contract obligations. With the winter ahead, however, this position will doubtless be reversed in the near future.

The mild weather accounts for the temporary lull in the house coal section of the trade, although it is generally anticipated that within the next few weeks the situation will be similar to that experienced in September, when orders were delayed. Householders will be well advised, therefore, to lay in ordinary stocks to cover their immediate requirements.

There is a more optimistic tone in respect of industrial fuel, possibly due to the result of the General Election. It is therefore too early to express a decided opinion as to the actual results and the time of transition. While some industries are working longer hours, especially the Lancashire cotton trade, there are reports of an opposite kind from the woollen and iron and steel trades in Yorkshire.

There is no alteration in the shipping outlook, and matters remain dull. Furnace coke prices continue to decrease, and many producers have reduced their output. Gas coke is also being discounted.

Prices at Hull at the week-end were: Bunkers—Yorkshire, Derby, and Notts large screened steam, f.o.b. Humber ports, 17s. 6d. to 20s. 6d. per ton. Cargo for export, f.o.b. usual shipping ports—Best Yorkshire hards, Association, 23s.; Derby best hards, 24s. 6d. to 25s. 6d.; West Yorkshire Hartleys, 18s. to 23s.; South Yorkshire washed doubles, 19s. to 19s. 6d.; ditto washed singles, 18s. to 18s. 6d.; dry doubles, 15s. to 16s. 6d.; South Yorkshire washed smalls, 14s. 6d.; Derby slack, 1 in., 17s. 6d.; South Yorkshire rough slack, 10s.; gas coke, 32s. to 33s.; foundry furnace coke, 19s. 6d. to 20s.; washed smithy peas, 21s. 6d. to 25s.; washed steam thirds, 18s. 6d. to 19s.; South Yorkshire washed trebles, 22s. 3d. to 22s. 6d.

Fatal Accident at the Granton Gas-Works.—While a man named James Messer was digging at the foundations of an addition to the gas-works at Granton, Edinburgh, last Wednesday, a large quantity of earth fell upon him, fracturing his skull and breaking both his legs. He was speedily conveyed to the Royal Infirmary, where it was found he was dead.

Coke-Oven Gas Supply to Middlesbrough.—In connection with the Middlesbrough Corporation's arrangement to use coke-oven gas from the Newport Iron-Works, Messrs. Dorman, Long, & Co. have written stating their preparedness to enter into a definite agreement. The letter states that it is anticipated that the amount of coke-oven gas available will be approximately 4,000,000 c.ft. per day. The Corporation must agree to take, so long as the supply is available, a minimum of 2,000,000 c.ft. per day, the agreement to remain in force until determined by either party giving to the other two years' notice at any time after the expiration of three years from the date of the agreement, the price to be paid to be the same as under the present arrangement. The Gas Committee have agreed to a continuance of the agreement; but the final terms and conditions have been left with the Chairman (Sir Joseph Calvert).

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 10.

There is a good deal more inquiry for pitch, and the tone of the market is decidedly firmer. Buyers are gradually coming up to their ideas of value. The price is called from 50s. to 52s. 6d. per ton. Creosote is a steady market, and the price is firm at 6¼d. per gallon f.o.b. makers' works. Tar spirits are steady, pure toluole being about 1s. 9d. per gallon, pure benzole about 1s. 7d. per gallon, and 95-160 solvent naphtha about 1s. 6d. per gallon.

Tar Products in the Provinces.

Nov. 10.

The markets for tar products have been steady throughout the past week, and, rightly or wrongly, there appears to be an opinion that business will probably be better as the result of the Election. Pitch is still steady. Business continues to be done at 42s. 6d. to 45s. for November shipment; one or two small parcels having been sold at the former figure. For January-April, however, 47s. 6d. to 50s. is asked. There are still sellers of Continental pitch at under 50s. a ton, in spite of the fall which has taken place in both the French and the Belgian exchange. Creosote is steady, but with little or no business doing here. The general opinion appears to be that we may possibly have a slight improvement in this article, due to the American Elections. At any rate, it is evident that a considerable amount of American business has been held over pending the conclusion of the Election. Other tar products are steady at existing prices.

The average values for gas-works products during last week were: Gas-works coal tar, 27s. to 32s. Pitch, East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, 37s. 6d. to 40s.; Liverpool, 38s. 6d. to 41s.; Clyde, 41s. to 42s. Benzole 90 p.ct., North, 1s. 2d. to 1s. 3d.; crude 65 p.ct. at 120° C., 9¼d. to 10¼d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 2d. to 1s. 3d. Toluole, naked, North, 1s. 3d. to 1s. 4d., nominal. Coal tar crude naphtha in bulk, North, 7d. to 7½d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 4d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 5d. to 5¼d.; salty, 5d. to 5⅛d.; Scotland, 5d. to 5⅛d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 60 p.ct, 1s. 7d. to 1s. 8d. prompt. Naphthalene, £13 to £15; salts, £4 to £7, bags included. Anthracene, "A" quality, 3½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Ideal Home Exhibition at Newport (Mon.).—The gold medal and diploma offered for the best display at this exhibition was, it is pleasing to note, gained by the Newport (Mon.) Gas Company.

Underground London.

On Monday, Nov. 3, before the Society of Engineers, Mr. W. J. Liberty, Public Lighting Superintendent of the City of London, read a paper entitled "Underground London," illustrated by about 100 specially-prepared slides. The President of the Society, Mr. G. A. Becks, Assoc.M.Inst.C.E., was in the chair. Commencing with Roman London, Mr. Liberty described the numerous excavations made in the City of London by which many parts of the Roman wall had been laid bare, and Roman baths, tessellated pavements, caverns, lamps, coins, &c., had been brought to light. Mention was made of the old Roman roadway discovered at Ludgate Hill, and of a presumed causeway spanning the Fleet from Fleet Street up to the site of the alleged Temple of Diana at the top of Ludgate Hill. A plan was shown of Wren's idea of what London would have been like had he been given free scope for his desires. The lecturer then dealt in detail with the many hidden rivers, wells, springs, spas and bournes, giving their courses, particularly mentioning the Walbrook, Effra, the Wandle, and the Fleet, telling of the immense amount of lore, tradition, and historical fact concerning the latter. From this it was a step to the great sewers serving the metropolis (including the notorious Fleet Ditch), the low-level discharges at Barking, including the "intercepting" and "chemicalizing" works there. Following this came a description of the subways of London from their inception in 1864, and the raising of the Valley of the Fleet. Lastly, the lecturer spoke of the recent excavations on the site of Tyburn, near the Marble Arch.

The New Gas-Works at Lytham.—At a recent meeting of the Lytham St. Annes Council, Alderman H. N. Whittle, the Chairman of the Gas Committee, referred to the opening of the new gas-works, and said that with the reduction in fuel prices the borough would have a cheaper and better supply of gas. The Mayor eulogized the excellent services of Mr. Ranft, the Gas Engineer, in the inception of the new works, which, he said, had been carried out with credit to the Engineer and to the Council.

The Lytham Train Disaster.—At the Ministry of Transport inquiry, on Nov. 6, into the Lytham express train disaster, which resulted in the deaths of 14 persons and injuries to over 30 others, Mr. J. H. Ranft, Gas Engineer of Lytham-St. Annes, told the story of how, while standing at the corner of his office, he saw the train going normally. Then came the crash. He saw the lights go out of the first coach, and the train part in two. He sent his men with tools and ropes, and telephoned to the Lytham Railway Station for help. The train was not on fire when he got to the scene. A certain amount of gas was escaping from the standing coaches, but he thought the last coach caught fire from the cabin debris. "In all my experience I have never seen a man who acted with greater judgment than Mr. Ranft," said Mr. Follows, Chief Traffic Superintendent, as he publicly thanked Mr. Ranft.

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MANCHESTER.

STOCK MARKET REPORT.

THE general optimism resultant on the General Election continued during the past week, and, in spite of the tightness of money and premature fears regarding a rise in the Bank rate, fresh buyers came into the markets, while prices continued in an upward direction. In addition, new issues are coming along, both Colonial Government and Home Railways being in the market. An outstanding new issue to gas investors is that of the Wandsworth, Wimbledon, and Epsom Company, who are offering, through Messrs. A. & W. Richards, for sale by tender £280,000 new capital.

The prospect of a strong Conservative Government had a good influence on Indian Loans, which were well up on the week; in fact in all the markets the story was the same, and may be expressed in one word—confidence. There was an enormous turnover in Industrials. Tobaccos continue to soar, especially British American on optimistic dividend and bonus rumours. If anything the improvement in prices has been a little overdone, and it must be expected that profit-taking by in-and-out operators will cause temporary checks.

In the Gas Market the rise of 7 points in the British 7 p.c. preference was the outstanding feature; but it will be seen by the list that, with the exception of one *ex* div. quotation, the variations all showed improvements.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 65, 66, Bombay 5½ *ex* div., Brentford "A" 113, 5 p.c. preference 91, 6 p.c. Richmond debenture 102½, Brighton and Hove original 173, 174, "A" 127, British 117½, Commercial 4 p.c. 93½, 94, 94½, 3½ p.c. 93½, 94½, Continental Union 41, European 8½, Gas Light and Coke, 94½, 95⅛, 95¼, 95⅛, 95⅝, 3½ p.c. maximum 62½, 63½, 4 p.c. preference 80, Imperial Continental 175½, 176, 176½, 178, Montevideo 60⅜, Primitiva 9s. 3d., South Metropolitan 99, 99⅛, 99⅜, 100⅛, 100⅜, 100½, 100⅝, South Suburban 5 p.c. 107½, 108. Supplementary prices, Romford 4½ p.c. debentures 86, 86½.

On Tuesday, Alliance and Dublin 65, 65⅜, 65⅝, Brentford "B" 114, British 117½, Cape Town 4½ p.c. preference 6½, Commercial 3½ p.c. 94, European £8 5s. 9d., Gas Light and Coke 95, 95⅛, 95⅛, 95⅜, 95⅝, 4 p.c. preference 79½, Imperial Continental 177, 3½ p.c. debenture 71, Primitiva 8s. 7½d., 8s. 10½d., San Paulo 5 p.c. debentures 42, 42½, South Metropolitan 99⅝.

On Wednesday, Alliance and Dublin 65, Brentford "A" 114, 115, "B" 113, European 8½, Gas Light and Coke 95⅛, 95⅛, 95⅜, 95⅝, 96, 3 p.c. debenture 61½, Imperial Continental 178, 178½, Montevideo 60⅜, 61½, Primitiva 8s. 10½d., 9s., 9s. 1½d., 4 p.c. 1st debentures 78½, 79, South Metropolitan 100, Tottenham "B" 101⅜.

On Thursday, Aldershot "C" 81½, 4 p.c. preference 74, Alliance and Dublin 66, Bombay 5⅛½, Brentford "A" 113½, British 117, 7 p.c. preference 127, Commercial 4 p.c. 95, 3½ p.c. 95, Continental Union 40⅝, European 8½, 8⅝, Gas Light and Coke 95⅛, 95⅝, 96, 96⅛, 96½, 3½ p.c. maximum 62½, 4 p.c. preference 81, Montevideo 60⅜, 61½, 61⅛, Primitiva 8s. 10½d., 9s., 4 p.c. (Buenos Ayres) debenture 61, San Paulo 5 p.c. debentures 42⅛, 42⅜, South Metropolitan 100, 100¼, 6½ p.c. debenture 104, Tottenham "B" 102½. Supplementary prices, Brentford 7½ p.c. mortgages 105½, 106½.

On Friday, Aldershot 4 p.c. preference 74½, Brentford "B" 113½, Continental Union 39½, 40, 7 p.c. preference 92, 92⅞, European 8⅝, Gas Light and Coke 96, 96⅛, 96½, 96⅝, 96¾, 97, 3½ p.c. maximum 63, Montevideo 61½, Primitiva 8s. 9d., 8s. 10½d., San Paulo 5 p.c. debentures 43½, South Metropolitan 100, 101, 6½ p.c. debenture 105. Supplementary prices, Southend-on-Sea 5 p.c. new 86½, 87.

As we have indicated above, there was a tightness of money during the week; but on Friday loanable credits were more plentiful, and money was obtainable from 2½ p.c. down to as low as 2 p.c. The shortness of money was illustrated, however, by the rate at which Treasury Bills were allotted, the average rate rising to £3 14s. 1·6d. p.c., which, comparatively, all but wiped out the fall which occurred the previous week.

The feature of the Foreign Exchange Market was the continued strength of sterling, the rate closing on Saturday at 4.59½. This, in Banking circles, is not attributed to the political development, and is most encouraging. French francs on Friday did not maintain the improvement shown earlier in the week, and closed at 87.42½. The Belgian exchange closed at 95.35, and Italian lire at 105.90.

The Silver Market was again dull, and the cash price fell ½d. to 34½d. per oz.

The Bank rate is 4 p.c., to which it was raised from 3 p.c. on July 5, 1923. Bankers' deposit rates are 2 p.c. The deposit rates of the discount houses are 2 p.c. at call and 2½ p.c. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Nov. 7.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 14	5	5	Aldershot 5 p.c. max. C.	80—83	..	81½
335,492	,,	,,	4	4	Do. 4 p.c. Pref.	72—77	..	74—74½
1,531,868	,,	Sept. 25	6	6½	Alliance & Dublin Ord.	62—67	+1	65—66
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	63—68	..	..
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5—5⅛	..	5⅛—5⅛
100,000	10	Aug. 14	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
383,110	10	,,	7	7	Do. B 7 p.c.	12½—13	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½	..	..
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb.	54—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—79	..	..
992,045	,,	July 10	6 7/10	6 7/10	Brentford A Con.	110—115	..	113—115
999,500	,,	,,	6⅝	6⅝	Do. B New	110—115	..	113—114
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	87—92	..	91
306,690	,,	June 12	4	4	Do. 4 p.c. Deb.	75—80	..	..
181,337	,,	,,	—	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	102½
214,740	,,	Aug. 28	11½	11½	Brighton & Hove Orig.	170—175	..	173—174
244,200	,,	,,	8½	8½	Do. A Ord.	125—128	..	127
1,287,500	,,	July 24	5	5	Bristol 5 p.c. max.	92—93*a*	..	..
855,000	,,	Sept. 25	7	8	British Ord.	115—120	..	117—117½
100,000	,,	June 26	7	7	Do. 7 p.c. Pref.	125—130	+7	127
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—77	..	..
100,000	10	May 22	6	8	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.	6—7*	..	6½
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb.	71—76	..	..
626,860	,,	July 24	6	6	Cardiff Con. Ord.	97—100	..	..
237,860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb.	103—106	..	..
157,150	,,	Aug. 14	6½	5	Chester 5 p.c. Ord.	86—91*b*	..	..
1,313,280	,,	July 24	6	6	Commercial 4 p.c. Cap.	93—96	+1	93½—95
560,000	,,	,,	6	6	Do. 3½ p.c. Cap.	93—96	+1	93½—95
475,000	,,	June 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	38—43	..	39½—41
200,000	,,	June 12	7	7	Do. 7 p.c. Pref.	89—94	+2	92—92 7/8
660,000	,,	Aug. 28	6½	6½	Croydon sliding scale	101—104	..	..
284,975	,,	,,	5	5	Do. max. div.	84—87	..	..
492,270	,,	Aug. 28	9	6	Derby Con.	107—110	..	..
55,000	,,	July 10	4	4	Do. Deb.	74—76*c*	..	..
209,000	,,	Oct. 9	5	5	East Hull 5 p.c. max.	—	..	..
1,002,180	10	July 24	2	6	European, Ltd.	8½—9½	+½	8½—8⅝
16,503,045	Stk.	Aug. 14	5½	5½	Gas Light & Coke 4 p.c. Ord.	95—97	+1	94½—97
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	61—64	..	62½—63½
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—81	..	79½—81
4,761,930	,,	June 12	3	3	Do. 3 p.c. Con. Deb.	60—63	..	61½
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Sept. 11	6½	6½	Hastings & St. L. 5 p.c. Conv.	95—100	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	75—80	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	15½—16½	..	..
86,600	Stk.	Aug. 14	10	10	Hornsey 7 p.c.	138—143	..	..
1,076,000	,,	May 22	10	30	Imperial Continental Cap.	175—180	+2	175½—178½
263,950	,,	Aug. 14	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	+2	71
335,242	,,	Aug. 14	6½	6½	Lea Bridge 5 p.c. Ord.	97—102	+2	..
4,127,340	,,	Aug. 14	5½	5½	Liverpool 5 p.c. Ord.	90½—91½*b*	+½	..
600,000	,,	Sept. 25	7	7	Do. 7 p.c. Red. Pref.	102—105*b*	..	..
164,736	,,	Aug. 28	8	9	Maidstone 5 p.c. Cap.	120—125	..	..
63,480	,,	June 26	3	3	Do. 3 p.c. Deb.	53—58	..	..
75,000	5	,,	5	7	Malta & Mediterranean	3½—3¾	..	..
341,920	Stk.	June 12	4	4	Montevideo, Ltd.	59—62	+1	60¾—61½
1,975,892	,,	July 24	5½	5	Newcastle & Gateshead Con.	82½—83½*d*	..	..
250,166	,,	,,	4	4	Do. 4 p.c. Pref.	74—75*d*	..	..
329,705	,,	June 26	3½	3½	Do. 3½ p.c. Deb.	69—71*d*	..	..
15,000	10	Aug. 28	11	11	North Middlesex 10 p.c.	16—17	+½	..
75,940	10	,,	7 7/10	7 7/10	Do. 7 p.c.	11½—11¾	..	..
300,000	Stk.	May 8	9	7	Oriental, Ltd.	99—102	..	..
138,120	,,	June 26	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	112—117	..	..
60,000	50	Aug. 28	13	13	Portsea Island B	99—102	..	..
100,000	50	,,	12	12	Do. C	95—100	..	..
2,289,909	1	—	—	—	Primitiva Ord.	8/6—9/6	..	8/7½—9/3
341,400	100	June 2	4	4	Do. 4 p.c. Red. Deb.	76—79	..	78½—79
900,000	Stk.	July 24	4	4	Do. 4 p.c. Red. Deb. 1911	57—62	..	..
220,335	,,	June 26	4	4	Do. B. Aires 4 p.c. Rd. Db.	57—62	..	61
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	57—62	..	..
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref.	6½—7½	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—44	+1	42—43½
270,000	Stk.	Aug. 28	5/8/4	5½	Sheffield A	103—105*e*	..	..
419,968	,,	,,	5/8/4	5½	Do. B	103—105*e*	..	..
1,047,000	,,	,,	5/8/4	5½	Do. C	103—105*e*	..	..
90,000	10	Oct. 23	8	6	South African	7—9	..	..
6,609,893	Stk.	Aug. 14	6½	5	South Met. Ord.	99—101	..	99—101
102,580	,,	July 10	5	5	Do. Red Pref.	98—100	..	..
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	59—62	..	..
734,000	,,	Sept. 11	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	104—105
91,500	,,	Aug. 28	8½	8½	South Shields Con.	134—136*d*	..	..
1,087,795	,,	Aug. 14	6½	6½	South Suburban Ord. 5 p.c.	104—109	..	107½—108
368,837	,,	June 26	5	5	Do. 5 p.c. Deb.	93—98	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83—86*	−2	..
121,275	,,	June 26	4	4	Do. 4 p.c. Deb.	73—78	..	..
250,000	,,	Aug. 28	7	7	Swansea 7 p.c. Red. Pref.	102—104	..	..
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	July 24	8	8	Tottenham District A 5 p.c.	118—121	+2	..
188,275	,,	,,	6½	6½	Do. B 3½ p.c.	100—103	..	101½—102½
181,255	,,	June 12	4	4	Do. 4 p.c. Deb.	76—80	..	..
238,251	,,	Aug. 28	7/14/4	5	Tynemouth Con. and New	84—86*d*	..	..
30,000					Wandsworth, Wimbledon, and Epsom—			
255,636	,,	July 10	9½	9½	Wandsworth A 5 p.c.	135—140	..	..
108,075	,,	,,	7½	7½	Do. B 3½ p.c.	113—118	..	..
240,865	,,	,,	6/7/9	6/9/6	Do. C	96—101	..	..
332,000	,,	,,	6/7/9	6/9/6	New Ordinary	..	..	..
98,000	,,	,,	7½	7½	Wimbledon 5 p.c.	110—115	..	..
88,416	,,	,,	7½	7½	Epsom 5 p.c.	115—120	..	..
	,,	June 26	3	3	3 p.c. Deb.	55—60	..	..

Quotations at:—*a*.—Bristol, *b*.—Liverpool, *c*.—Nottingham, *d*.—Newcastle, *e*.—Sheffield. * Ex½ div.

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Benzole Import.—The "Petroleum Times" for Nov. 1 says that on the previous Monday 110,947 gallons of benzole were imported from Antwerp for the National Benzole Company, Ltd.

Oswaldtwistle Gas Undertaking.—The abstract of accounts for Oswaldtwistle shows a net profit on the gas-works, last year, of £5650, and a reserve and renewals fund of £9655. The capital outlay at March 31 was £72,565, and the outstanding debt £8577. From 1907 till 1922 the gas-works had annually made large contributions to relief of rates, or borne the cost of street lighting. During one year, £2210 was handed over to the rates.

New L.C.C. Gas Meter Testing Station.—The London County Council have erected at Helmet Row, Finsbury, a testing office, which will eventually be the largest of its kind in the United Kingdom. In 1864, 31,186 meters were tested, and the fees received amounted to £1026. For the year 1923-4 the figures were 287,418 and £17,713. The site of the present office was acquired for £4000; and the building, which has been designed on strictly economical lines, has cost £10,600.

Carnoustie Gas-Works Finances.—At a recent meeting of the Carnoustie Town Council, Bailie Balla dealt with the gas-works. To meet the increased consumption of gas, he said, the old retorts would have required 1500 tons of coal more than the new vertical retorts require. Not only would this have meant big extra expense, but also have entailed outlay in extra labour. In 1914 they purchased coal at 18s. a ton; to-day the figure was 30s. The wages bill in 1914 was £727, and to-day it was £1054, while their local and Imperial taxation had risen from £372 to £1200. In the aggregate the expenditure had increased 90 p.ct. In 1914 the gas rate was 3s. 6½d.; to-day it was 5s. 2½d.—slightly under 50 p.ct. increase.

The Omagh (co. Tyrone) Urban District Council have reduced the price of gas by 10d. per 1000 c.ft. to 5s. 10d.

The Todmorden Corporation report an income from the gas undertaking, last municipal year, of £51,340; and there was a surplus of £3626, increasing the balance in hand to £9496.

The Batley Corporation Gas Department are holding a special "Sales Week" from Nov. 17 to 22, when all gas appliances sold will be charged only at cost price, and fixed free up to 20 ft. of piping.

Two gas explosions occurred last Thursday week in Paris in the basements of two large buildings, Nos. 58 and 62, Rue de la Chaussée d'Antin, near the Paris Office of "The Times." Both were caused by a short circuit of the electric current, which melted the gas-pipes. One man was injured.

Damage to the extent of some £500 was done by fire which broke out at midday last Friday in the tar distillery of Messrs. J. & E. Morton, Milnsbridge, near Huddersfield. A brick-built still containing about 10 tons of tar had become fired by some of the contents having leaked through a hole and come into contact with flame. The fire brigade were quickly masters of the situation.

In the course of a tribute to Mr. Hartley Fletcher, Chairman of the Scarborough Lighting Committee, who has retired from the Town Council with the close of the municipal year, Mr. Moore, a member of the Council, stated that Scarborough has secured the proud position of being the third best lighted town in the world—London and Paris being first and second respectively. The bulk of the public lighting at Scarborough is by gas, including the new and brilliant scheme on the sea-front.

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